FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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CONTENTS

DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

1927

Jan. 6 .... **Major B. C. Carter, A.R.C.Sc. D.I.C., A.F.R.Ae.S. "Dynamic Forces in Aircraft Engines," before R.Ae.S.**

Jan. 13 .... **Professor F. C. Lea, D.Sc., M.Inst.C.E., M.I.Mech.E. "Some Experiments on the Effects of Repeated Stresses on Materials," before Inst.Ae.E.**

Jan. 20 .... **H. Glanert, M.A., F.R.Ae.S. "The Theory of the Autogiro," before R.Ae.S.**

Feb. 10 .... **Mr. H. P. Folland, F.R.Ae.S., M.B.E. (Honours Member). Paper, to be announced later, before Inst.Ae.E.**

EDITORIAL COMMENT.

"IF we look back over the 23 years of flight—indeed, if we only look back as far as the last Imperial Conference in 1923, we must be struck by the speed and the extent of the progress that has already been made. You will see in the comprehensive memorandum entitled 'The approach towards a system of Imperial Air Communications' that I have circulated, a picture of civil air transport as it is to-day. You will note that wider and wider use is being made of it. Since the last conference the mileage covered by the regular air routes of the world has more than doubled. You will note the technical improvement that has been made with machines, engines, wireless and meteorology. Machines have become more powerful, more dependable, and, as I think the members of the Conference who made flights at Croydon will admit, more comfortable. As to safety, what better record could there be than the 5,000,000 miles flown by British services for four fatal accidents, and the million miles flown in Australia for a single fatal accident?"

Progress of Commercial Aviation

At the end of the year, in the last issue of FLIGHT of 1926, this passage from the statement on Imperial Air Communications made to the Imperial Conference, 1926, by Sir Samuel Hoare, the Secretary of State for Air, and published in "The Approach towards a System of Imperial Air Communication," issued by H.M. Stationery Office, sums up very briefly the progress that has been made in civil aviation up to the present time. It also affords an opportunity for having one final look around, as it were, at the position of British civil aviation at the close of the year. Sir Samuel's statement that "since the last conference the mileage covered by the regular air routes of the world has more than doubled" is interesting, and augurs well for the future of commercial aviation. If, however, we examine the figures for British aviation, the picture is, unfortunately, less promising.

To quote from the memorandum a few statistics: In 1919 the mileage flown over the regular air routes

of the world was 1,170,000. In 1925 this figure had increased to 12,480,000. In 1919 the number of letters carried by the French Latecoere air lines between Toulouse and Casablanca was 9,124. The corresponding figure for 1925 was 7,502,191. In the United States the number of miles flown during the four fiscal years 1918-22 was 2,635,433, while during the four fiscal years 1922-25 the number of miles had increased to 7,891,099. The number of passengers carried by all the cross-Channel services has been increasing at the rate of nearly 3,000 a year between 1920 and 1925, while the passenger traffic for the first six months of 1926 was 43 per cent. greater than that in the corresponding period of 1925.

All this is very gratifying, and is a definite proof, if such were needed, that civil aviation has come to stay, and has before it a future the immensity of which can at present only be guessed at. If, however, we come down to earth and look a little more closely into that part of the world's regular air lines which concerns ourselves most directly, the British air lines, the picture is not quite so rosy. For instance, if we refer to the figures relating to the cross-Channel services, it is found that in 1920, out of a total number of 10,731 passengers carried, the British services carried 5,256, or just under half. In 1922 British services carried 9,490, while foreign services carried only 2,869. For the year 1923 the figures were British, 11,947; foreign, 3,189. For 1924 the British figure had dropped to 10,456, while the foreign had increased to 7,402, and finally, last year (1925) the British lines carried 10,602, and foreign lines 10,119. Thus, while the British figure has remained stationary for three years, foreign figures have increased to a vast extent, and now practically equal ours. We do not wish to dwell unduly upon this fact, but it should not be lost sight of. It is in no carping spirit that we wish to refer to the way in which British civil air lines have lost ground, or at any rate, have failed to maintain their lead over foreign competition, but there is no useful purpose served in blinking the fact.

On the score of safety the British lines have cause for congratulation. To have flown five million miles in the course of seven years, with only four accidents involving the death of passengers is a record of which we may justly be proud. A chart given in Sir Samuel's memorandum shows that whereas in the period from 1919 to 1920 the number of miles flown per accident was only 168,000, it has risen to over one million miles during the period from 1919 to 1926. This is at any rate proof that the British policy of safeguarding passengers in every possible way is thoroughly sound, and is justification for the system in force of inspecting and overhauling machines.

Probably very closely bound up with this excellent safety is the question of insurance, and on this subject it is interesting to find in the memorandum the statement that whereas in the earlier days of civil aviation insurance premiums were as high as 30 per cent. or so per annum, they are now lower than for surface transport. Thus on the London-Paris service the insurance per £100 for goods sent by surface transport is 6*s*. 8*d*., while by air the premium is only 2*s*. This is a most gratifying feature of modern air transport, and the memorandum points out that this difference in insurance rates has caused considerable quantities of gold to be exported by air from England, and that in 1925 over ten million pounds sterling of bullion and specie were carried by the cross-Channel services.

On the subject of reliability there is one very encouraging official admission in the memorandum. "The reliability of the services," the memorandum states, "is most easily expressed by the percentage of flights commenced which were completed without interruption, *although this basis admittedly gives a more favourable impression than is justified, since it disregards scheduled services not begun.*" For several years FLIGHT has hammered away at this very point, indicating that by refusing to fly in anything but perfect conditions it is relatively easy to maintain 100 per cent. reliability, although such a service would be of little practical value. We are extremely glad that at last we have an official admission that this point is conceded, and we may now hope for returns based upon number of flights completed to number of flights scheduled.

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The Seaplane

In connection with Sir Samuel Hoare's memorandum on Imperial air lines the following passage occurs: "In the meanwhile we in Great Britain should be interesting ourselves in forging the link between London and Egypt. Already we have made considerable progress with the development of flying-boats that will be suitable for the passage of the Mediterranean, and attention is being constantly given to the difficulties that have hitherto blocked the way to an England-Egypt service."

If this sentence means anything at all, and Sir Samuel Hoare is not given to idle talk, as those who know him will agree, it means that it is not the intention of the Government to sit down and wait for the arrival of the commercial airship before commencing the "home leg" of the Empire air route, but to push ahead with heavier-than-air craft, the capabilities of which we already know, while those of the airship must remain somewhat speculative for another year or two at least.

This is good news, indeed, and in some ways is one of the most encouraging passages in the whole publication. There will be no need for us to state again the case for the fullest possible use of the seaplane in Empire air communications. That has already been done so often in FLIGHT that our readers probably know the pros and cons by heart by this time. So far as we are aware, however, this is the first official intimation that the Government has a seaplane policy. We scarcely count as part of such a policy the weekly, we had almost written weakly, service from Southampton to the Channel Islands operated by Imperial Airways.

Perhaps it may be taken for granted that the flying-boats to which Sir Samuel refers are the new Short "Calcutta" type, two of which are on order and under construction for Imperial Airways. It is now permissible to state that these new machines will be all-metal flying boats, powered by three "Jupiter VI" engines, and carrying 15 passengers each. They will have a range of 500 miles, or sufficient for crossing either the Mediterranean or the North Sea, and will have a wing spread of 93 ft., and a total loaded weight of 19,600 lbs.

["FLIGHT" Photograph

THE FIRST IMPERIAL AIR ROUTE : Out of the darkness into sunshine. The lower picture was taken in the early hours of Monday morning just before the inaugural flight to India, and shows a small crowd of enthusiasts, who braved the bitter cold, gathered at Croydon to give Sir Samuel Hoare a hearty send-off. Above, the "Hercules" taken from another machine (at 7000 ft.) a few days previously.

THE FIRST IMPERIAL AIR ROUTE

Sir Samuel Hoare Inaugurates the Cairo—Karachi Air Route

MONDAY, December 27, 1926, marks, without doubt, one of the biggest events in the history of British aviation, for the Secretary of State for Air, Sir Samuel Hoare, not only officially inaugurated the first of what we hope will be a chain of Imperial air routes, linking up the various Dominions with the Mother Country, but the Air Minister, in addition to flying nearly 3,000 miles in the first scheduled machine from London to Egypt, thence over the new route to Karachi (another 2,000 miles), is also taking the opportunity on his arrival in India of making an extended inspection of all the R.A.F. stations on the north-western frontier of India—again employing the aeroplane as his means of transport.

It was still dark—and bitterly cold—when a small crowd assembled on Croydon aerodrome on Monday morning to witness the start of the first official flight to India by the "Hercules" No. 3. Just before Sir Samuel Hoare and Lady Maud Hoare left home for the aerodrome the following telegram from the King was received :—

"The Queen and I wish you and Lady Maud *bon voyage*, a successful visit, and a safe return home.—GEORGE R.I."

Among those present to see Sir Samuel's machine off and wish the party Godspeed were Air Chief Marshal Sir Hugh Trenchard, Air Marshal Sir John Salmond, Air Vice-Marshal Sir Vyell Vyvyan, Lieut.-Col. I. A. E. Edwards, Sir Eric Geddes, Sir Samuel Instone, Mr. F. G. Bertram, Capt. Geoffrey de Havilland, Mr. R. Fedden, Mr. R. J. Meller, M.P. (for Mitcham Division of Surrey), and Col. the Master of Sempill and Mrs. Sempill.

Just before 7.30 a.m., the hour at which the machine was scheduled to start, Sir Samuel and his party took their places in the machine to the accompaniment of hearty cheering from those standing around. The party included, in addition to Sir Samuel and Lady Maud, Air Vice-Marshal Sir Geoffrey Salmond (who is journeying to India to take command of the R.A.F. in India), Mr. C. Ll. Bullock, Sir Samuel's private secretary, Corpl. Hetherington (R.A.F. Records Department, Sir Samuel's batman), and Mr. B. W. G. Emmott, who was with Sir Alan Cobham on the London–Cape Town flight, and who will take still and moving photographic records of the present flight. The crew consisted of Capt. F. L. Barnard (pilot), Sq.-Ldr. E. L. Johnson (navigator), Mr. Hatchett (wireless operator), and Mr. Mayer (Bristol Aeroplane Co.).

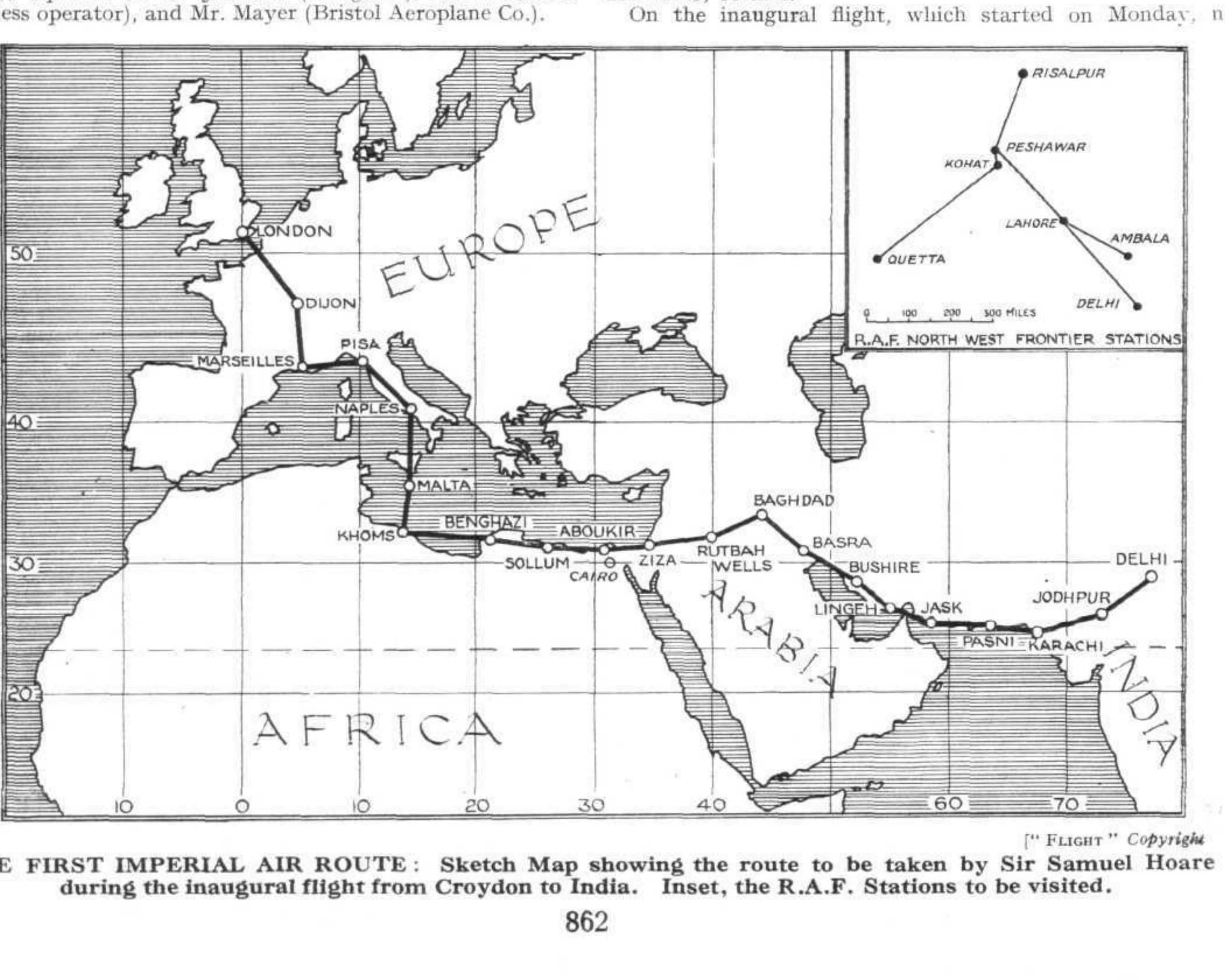
Weather conditions on this occasion were of the curate's egg variety, and although visibility promised to be fair, there was a strong north-east wind blowing, and weather reports indicated a probability of snow storms being encountered *en route*. It was at 7.36 a.m. that the D.H.66 "Hercules" opened out its three Bristol "Jupiter" engines and took off in the semi-darkness, with all its navigation lights on. Barnard did not circle the aerodrome, but set out straight for the coast as soon as he got the machine well off the ground. The "Hercules" was soon lost to view, and so started the first of our Imperial air routes. Then, it was a thrilling event, but, as Sir Samuel remarked just before he left, in a few years'time the air route to India "will be a very ordinary way."

"Hercules" No. 3 passed over Le Bourget at 9.40 a.m. and arrived at Dijon at 11.30 a.m. The Air Minister was received here by the Minister of Commerce and the Mayor, and after lunch the machine proceeded on its journey at 1 p.m. Marseilles was reached at 3.45 p.m.

References to this first Imperial air route have already appeared on several occasions in FLIGHT, so that it will only be necessary for us to mention here that the route is divided into two sections : (1) Cairo, Gaza (or Ziza), Rutbah Wells, Baghdad, and Basra ; (2) Basra, Bushire, Bandar Abbas, Charbar and Karachi. At first the service will be a fortnightly one over the first section (Cairo–Basra) only, starting on January 12, 1927, so timed as to connect with the ocean liners from and to England.

As soon as the five D.H. "Hercules" machines have been delivered, and, incidentally, experience has been gained of the complete route, the service will be extended to Karachi. The full time-table then will be as follows : Eastbound machines will leave Cairo for Ziza at 1 p.m. on Wednesdays proceeding from Ziza at 6 a.m. the next day, arriving at Basra at 5.35 p.m., proceeding from Basra at 6 a.m. (Friday), arriving at Bandar Abbas at 3.45 p.m., proceeding from Bandar Abbas at 6 a.m. (Saturday), and reaching Karachi at 4.45 p.m. Westbound times will be : Thursdays, Karachi, dep. 6 a.m., arr. Bandar Abbas, 4.15 p.m. on Fridays. Bandar Abbas, dep. 7 a.m., arr. Basra 4.25 p.m. ; Saturdays, Basra, dep. 6 a.m., arr. Ziza 5 p.m. ; Sundays, Ziza, dep. 7 a.m., arr. Cairo, 10 a.m.

On the inaugural flight, which started on Monday, no



["FLIGHT" *Copyright*

THE FIRST IMPERIAL AIR ROUTE : Sketch Map showing the route to be taken by Sir Samuel Hoare during the inaugural flight from Croydon to India. Inset, the R.A.F. Stations to be visited.

["FLIGHT" *Photograph*

THE FIRST IMPERIAL AIR ROUTE: This photograph was taken at Croydon just before the start; standing beside the D.H. "Hercules" (from left to right) are Capt. F. L. Barnard (pilot), Lady Maud Hoare, Sir Samuel Hoare, Sir Eric Geddes, Sir Samuel Instone, Mr. Bullock, and Air Vice-Marshal Sir Vyell Vyvyan.

attempt is being made to accomplish a fast journey. For one thing, it is probable that some time will have to be set aside at various stops *en route* for semi-official visits, conferences, etc. The following, however, is the provisional itinerary, which will be adhered to as far as possible :—

- December 27, 1926.—Croydon, Dijon (lunch), Marseilles (641 miles).
- December 28, 1926.—Marseilles, Pisa (lunch), Naples (574 miles).
- December 29, 1926.—Naples, Malta (410 miles).
- December 30, 1926.—Malta, Khoms (lunch), Benghazi (580 miles).
- December 31, 1926.—Benghazi, Sollum (lunch), Aboukir (650 miles).
- January 1, 1927.—Aboukir, Ziza for Amman (360 miles).
- January 2, 1927.—Ziza, Rutbah Wells (lunch), Baghdad (543 miles).
- January 3, 1927.—Baghdad, Basra (lunch), Bushire (520 miles).
- January 4, 1927.—Bushire, Lingeh (lunch), Jask (556 miles).
- January 5, 1927.—Jask, Pasni (lunch), Karachi (600 miles).

At Baghdad the machine will be joined by the Director of Civil Aviation, Sir Sefton Brancker (who is now on his way there in the first of the D.H. "Hercules" air liners which left Croydon on December 18) and Maj. Woods Humphery, general manager of Imperial Airways.

From Karachi the flight will be continued to Delhi, *via* Jodhpur (390 miles), where a stop for the night will be made before completing the final 300 miles to Delhi. At Delhi the Viceroy will christen the machine "City of Delhi," and after spending a few days at Delhi in conference with the Government of India, Sir Samuel, together with Sir Geoffrey, will begin his tour of inspection, in Service machines, of the R.A.F. stations (N.W. Frontier), visiting Ambala, Lahore, Peshawar, Risalpur, Khyber, Kohat, Arawali, and Quetta.

The Air Minister having completed his tour of the R.A.F. Air Stations, will return to Delhi for the home flight. It is expected that on the way home Sir Samuel Hoare and Sir Sefton Brancker will visit Khartoum, in order to be present at the inauguration of the Khartoum-Kisumu air service.

The tour of the Indian R.A.F. stations will cover roughly 2,000 miles, so that, together with the 6,200 miles from Croydon to Delhi plus the journey home, the Air Minister will have covered a total distance of nearly 15,000 miles in about six months.

In the meanwhile the first two D.H. "Hercules" air liners, which left Croydon on December 18 and December 20 respectively, have been pushing on towards Cairo. The first machine, carrying Sir Sefton Brancker, left Marseilles at 7.30 a.m. on December 20, and reached Naples at 4.30 p.m. that afternoon. No. 2 machine, piloted by Capt. Hinchliffe and carrying eight passengers (including two women), which left Croydon on December 20, arrived at Marseilles the same afternoon.

Leaving Naples at 10 a.m. on December 21, No. 1 machine experienced an adventurous time in attempting to reach Malta. Battling against a strong head wind, it passed over Messina at 11.30 a.m., but did not reach Malta when expected. Later in the day a message was received to the effect that a landing had been made at Catania, Sicily, and that it was decided to stay there the night. In the meantime "Hercules" No. 2 was catching up, having completed the Marseilles-Naples stage that same day (December 21).

Weather conditions improved on December 22, and both machines set out for Malta—No. 1 from Catania, and No. 2 from Naples. Sir Sefton's machine reached Halfar aerodrome (Malta) first, at 11 a.m., No. 2 arriving an hour and a half later. The next day the 230-mile sea crossing to Africa was successfully accomplished by both machines, No. 2 leaving Malta first, arriving at Khoms at 7.40 a.m., followed at 9.18 a.m. by No. 1.

Cairo was reached on December 24, No. 2 arriving first at 4.50 p.m., having established a record by accomplishing the 2,900 miles to Cairo in 26 hours 12 mins. No. 1 had slight trouble with the landing wheels at Sollum, and arrived at Cairo in the evening. This machine, with Sir Sefton Brancker on board, left Cairo for Baghdad, *via* Ziza, on December 27. No. 2 will stay at Cairo.

AIR MINISTRY NOTICES TO AIRMEN

Civil Air Navigators: Regulations for the Issue of Licences

IN consequence of recent amendments to Annex E of the International Air Convention, new regulations governing the circumstances in which a navigator must be carried on aircraft and minor changes in the syllabuses of the examination for the first and second-class licences will be brought into force as from January 1, 1928. The requirements will be to the following effect:—

I.—Requirements concerning the Carriage of Navigators

1. There shall be two classes of licences for navigators, viz., second class and first class.

2. A navigator who holds a second-class licence shall be on board:—

(*a*) every flying machine carrying passengers or goods for hire or reward, and having to make a continuous flight
of more than 100 miles over inhabited regions, or
of more than 100 miles but not more than 310 miles entirely over the high seas or uninhabited regions, or
of more than 15 miles but not more than 310 miles by night; and

(*b*) every airship of less than 700,000 cubic feet capacity, for every journey or flight.

3. A navigator who holds a first-class licence shall be on board:—

(*a*) every flying machine carrying passengers or goods for hire or reward and having to make a continuous flight of more than 310 miles either entirely over the high seas or uninhabited regions, or by night; and

(*b*) every airship of 700,000 cubic feet capacity or more, for every journey or flight.

4. A flying machine pilot who holds the necessary navigator's certificate may, even if he is alone on board, fulfil the duties of navigator:—

in the case of day flights over inhabited regions, or in the case of day flights of not more than 310 miles over the high seas or uninhabited regions, or

in the case of night flights over routes suitably marked and recognised as such by the competent authorities.

A flying machine pilot shall not perform the functions of navigator, either on a continuous flight of more than 310 miles over the high seas or uninhabited regions, or on a flight by night except in the case provided for in the preceding sub-paragraph, unless a second pilot is on board, who can in case of need take charge of the flying machine.

When, in addition to the pilot, an aircraft is required to have on board another member of the crew, the latter, if he holds the necessary navigator's certificate, may fulfil the duties of navigator, in the cases provided for in paragraphs 2 and 3 above.

NOTE.—For the purpose of the foregoing paragraphs:—

An "uninhabited region" is a region where, in consequence of the sparsity of the population and of the absence of natural landmarks or of the insufficiency of the maps, the difficulties of navigation are similar to those met with over the high seas.

A "night flight" is a flight which normally will continue for more than an hour after sunset or a flight commencing more than an hour before sunrise.

A "flight over the high seas" is one in the course of which an aircraft, in following a straight line, may find itself at a distance of more than 30 miles from the nearest shore.

II.—Requirements for Navigators' Licences

A.—*Second-class Licence*

1. *Air Experience.*—The candidate must produce proof that he has had at least two years' air experience as an operative member of the crew of an aircraft, during which at least 300 hours must have been spent in the air.

2. *Subjects of Examination.*—

(i) Form of the Earth; its divisions and their notation.

(ii) Maps and charts: how to read and use them; practical properties of different projections used in aviation.

(iii) Earth's magnetism, compasses, their construction, use and adjustment.

(iv) Flight by dead reckoning, with the use of instruments for the measurement and calculation of the elements of the triangle of velocities.

(v) Navigation by radiogoniometric bearings; methods of fixing the position of an aircraft, with the application of the necessary corrections.

(vi) International air legislation; regulations for preventing collisions at sea, publications for the assistance of navigators.

(vii) Meteorology; meteorological observations, arrangements for the issue of meteorological reports for aviation; principles of forecasting, construction and interpretation of synoptic charts, climatology.

(viii) Visual signalling.

(*a*) Use of signalling apparatus:—

(1) Semaphore—Ground. Ability to send and receive accurately messages made in plain language at the rate of 10 words per minute.

(2) Flashing—Ground and Air. Ability to send and receive accurately messages made either in coded groups or in plain language and numerals at the rate of eight words per minute on the ground and six words per minute in the air.

(As regards the rates of words referred to in (1) and (2) above, each word or group equivalent to a word will consist of at least five signals (letters or numerals.))

(*b*) Semaphore and Flashing Procedure. Detailed knowledge of the procedure for opening up communication and conducting messages by both of the above methods.

(*c*) International Code—Flags. Names and colours of the flags. Methods of reading the flags when hoisted.

B. *First-class Licence.*

1. *Air Experience.*—The candidate must produce proof that he has had at least four years' air experience as an operative member of the crew of an aircraft during which at least 600 hours must have been spent in the air, not less than 100 hours of this being experience of navigation in the air and not less than 15 hours being air experience in night-flying.

2. *Subjects of Examination.*—

(i) Form of the Earth; mathematical calculation of the various elements, *i.e.*, "the sailings" to obtain course and distance.

(ii) Maps and charts; principles of construction of the common forms of projection used in aviation.

(iii) Tides; elementary theory and prediction by the aid of tables.

(iv) Astronomical navigation, various methods of fixing the position of an aircraft, with the use and care of tables, diagrams and instruments for the solution of this problem, knowledge of the mathematics involved.

(v) Meteorology, more advanced knowledge of the subjects detailed in the requirements for the second-class licence.

(vi) General knowledge of wireless telegraphy and of the handling of internal-combustion engines used in aviation.

III.—Requirements for the Issue of Licences

Applicants for licences will be required to satisfy the examining board of the Air Ministry that they fulfil the conditions as to air experience, and will be required to pass an examination which will take the form of written papers, oral examination and practical tests. Candidates before taking the examination for a first-class licence must pass the examination for a second-class licence.

Further details concerning the syllabuses of these examinations, together with notes on books for study, can be obtained on application to the Secretary (C.A.2), Air Ministry, London, W.C.2.

IV.—General

Examinations in connection with the issue of navigators' licences are held about once every three months at the Air Ministry. Announcements concerning the dates of these examinations are notified periodically in Notices to Airmen.

The papers on visual signalling for the second-class licence and general knowledge of wireless telegraphy and of the handling of internal-combustion engines used in aviation for the first-class licence, are not included in the examination at present, but will be introduced on January 1, 1928, when the new regulations come into force.

No. 82 of 1926

Fitting of Safety Belts

IT is notified that with reference to Notice to Airmen No. 17 of the year 1926 and to the Air Navigation Directions, 1926 (A.N.D.6), para. 49 (1) (i) (a) of which stipulates that

a safety belt must be carried in all flying machines for each person (including the pilot) carried in an open cockpit and that such equipment must be maintained in working order, the attention of pilots is drawn to the necessity for ascertaining before flight that the belts are properly secured in all cases.

When a seat is unoccupied the safety belt should be so fastened as to avoid the possibility of fouling the controls. (No. 83 of 1926.)

NOTICE TO GROUND ENGINEERS.

Magnesium Alloy Castings.

IT is notified that owing to the corrosive tendencies of magnesium alloy castings (*e.g.*, electron metal) particular attention must be given to aircraft parts made of this material when periodic examinations are being conducted. Any parts showing depreciation as a result of corrosion must be replaced. No. 4 of 1926.

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CIVIL AVIATION IN AUSTRALIA

THE following are the official statistics of the Australian commercial air services, for which we are indebted to the *Fly Paper*, the official organ of the Australian Aero Club (N.S.W. Section).

The period covered for the figures given below is from December 5, 1921, to September 9, 1926. In addition to the operations contained in the table, the companies concerned—Western Australian Airways, Ltd. ; Larkin Aircraft Supply Co., Ltd., and Queensland and Northern Territory Aerial Services, Ltd.—engage in considerable taxi work, etc., off the service routes, the figures for which are not included in the table.

Route.	Perth–Derby (W.A.).	Larkin Services.*	Charleville–Camooweal (Queensland).	Totals.
Length of route (miles)	1,442	1,000	825	3,267
Date inaugurated	Dec. 5, 1921§	June 2, 1924*	Nov. 2, 1922†	—
Frequency of service	Weekly, each direction	‡	Weekly, each direction	—
Machine flights	3,980	2,261	2,888	9,129
Machine miles	667,593	283,502	288,565$\frac{1}{2}$	1,239,660$\frac{1}{2}$
Hours flown	8,837 : 20	3,645 : 5	3,720 : 15	16,202 : 40
Paying passengers carried over single stages	3,091	1,149	3,265	7,505
Paying passenger miles	553,221	131,158	311,040$\frac{1}{2}$	995,419$\frac{1}{2}$
Paying passengers injured on scheduled trips	Nil	Nil	Nil	Nil
Letters carried (to end of August, 1926)	796,765	16,237	60,878	873,880
Freight carried (lbs.)	63,351	393$\frac{3}{4}$	31,572	95,316$\frac{3}{4}$

§ Geraldton–Derby, December 5, 1921 ; Perth–Derby, January 15, 1924.

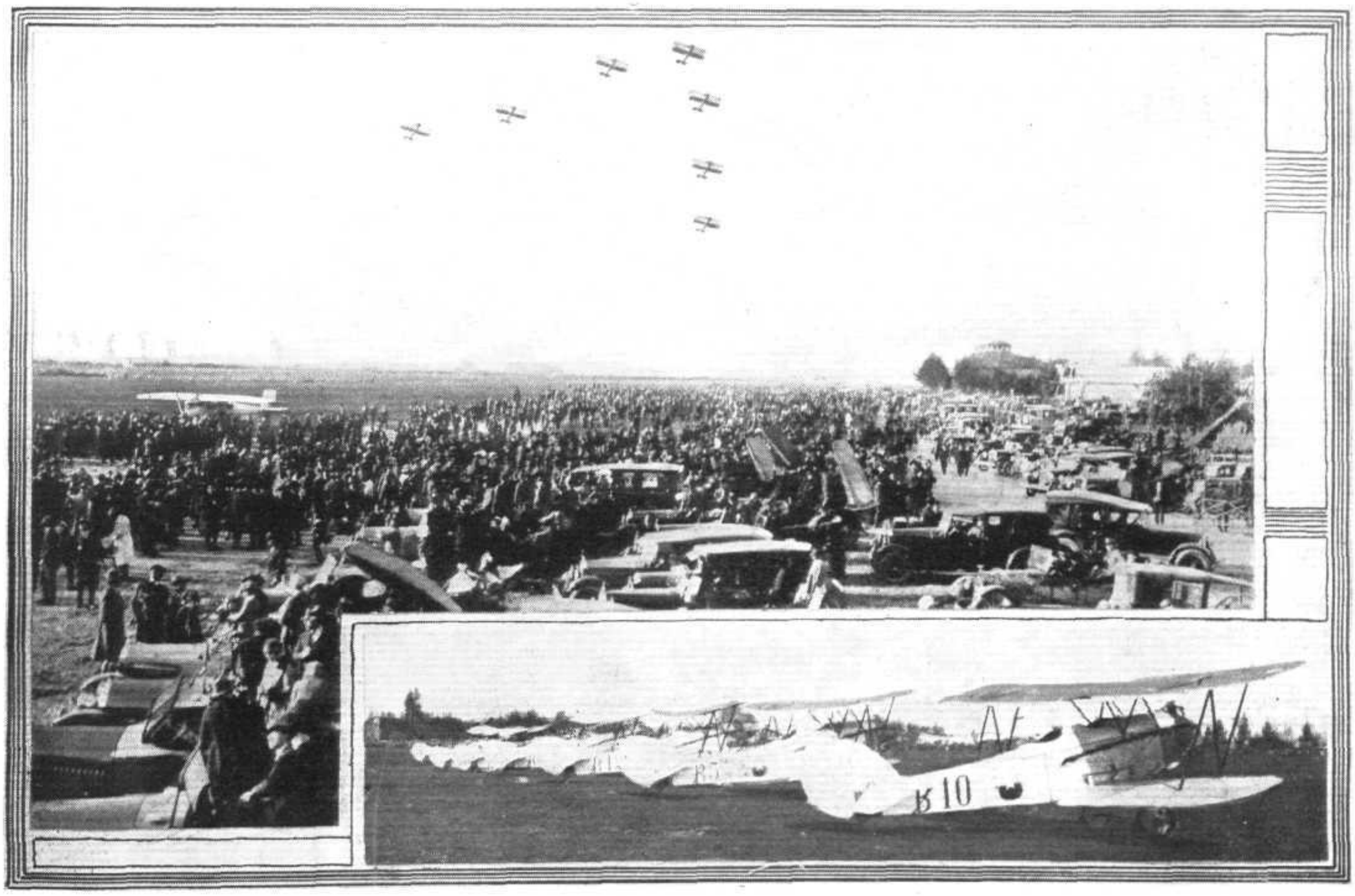
† Charleville–Cloncurry, November 2, 1922 ; Charleville–Camooweal, February 7, 1925.

* From June 2, 1924, to July 19, 1925, a weekly service was maintained by the Larkin Aircraft Supply Co., Ltd., between Adelaide and Sydney (790 miles). On July 19, 1925, the Adelaide–Sydney route was discontinued, but on July 21, 1925, the following services were inaugurated :—

‡ Once each way weekly—(1) Adelaide–Cootamundra, via Mildura and Hay (578 miles). Twice each way weekly—(2) Broken Hill–Mildura (189 miles). (3) Melbourne–Hay (233 miles).

All companies fly 7,378 miles weekly, viz. :—

Western Australian Airways, Ltd.	2,884 miles.
Larkin Aircraft Supply Co., Ltd.	2,844 ,,
Queensland and N.T. Aerial Services, Ltd.	1,650 ,,



BRISTOLS IN CHILE : For some time past the Chilian Air Force has been employing a number of Bristol-Lucifer School machines with highly successful results—both as regards machine and engine. We show above a picture of a formation of seven of these Bristol-Lucifer 'buses at an Air Display held last September at El Bosque Aerodrome, near Santiago. Below, the seven machines are shown lined up on the aerodrome.

AIRISMS FROM THE FOUR WINDS

Landing on Helvellyn

AFTER having made two unsuccessful attempts previously, Mr. John Leeming, Chairman of the Lancashire Aero Club, succeeded last week in landing an aeroplane on the summit of Mount Helvellyn, the famous Lake District mountain of 3,100 ft. Mr. Leeming's first attempt has already been reported in FLIGHT, and on December 21 he had a second try, when he flew from Woodford in the Avro "Gosport," fitted with an Avro "Alpha" engine, with Bert Hinkler, the Avro test pilot, as passenger. On this occasion, they encountered a gale, which in the regions of the mountains proved too much for them, so they returned to Lancaster. Here they spent the night, since ignition trouble had developed in the meanwhile. The following day conditions were much more favourable, so they set out for the third attempt. Mr. Leeming had previously paid a visit, on foot, to his lofty aerodrome in order to see how the land lay (mainly on the rough side, he found), and to mark out suitable landing spots. This latter was accomplished by means of strips of coloured material pegged out to mark the dangerous spots, whilst a fire was also lit in order to indicate the direction of the wind. As a matter of fact, Mr. Leeming did not land on any of the places originally "air-marked," but instead, managed to bring his Avro down within ten yards of the stone cross which marks the summit of the mountain. Here photographs were taken, and a "witness" signed a certificate, after which they successfully took off and returned safely to Woodford. Mr. Leeming stated that the air currents round about the mountains were very treacherous, and that they received several alarming bumps and drops—on one occasion the machine made a sheer drop of 500 ft.

The "Moths'" Eastern Tour

THE two D.H. "Moths," from Lancashire, piloted by Capt. T. N. Stack and Mr. B. S. Leete, are still proceeding merrily eastward. After a few days' stay at Baghdad (where they arrived on December 16) during which they were entertained by their old R.A.F. Squadrons (Nos. 45 and 70), these two pilots continued on their way towards India, and reached Bushire on December 27, having experienced a forced landing at Bandar Dilam en route.

The Spanish African Flight

THE Spanish Atlantic Squadron, consisting of three Dornier-Wal flying-boats, under the command of Major R. Llorente, which left Melilla on December 10, for Fernando Po, Spanish Guinea, successfully completed their mission on Christmas Day, having flown to Fernando Po in nine stages, via Casablanca, Las Palmas, Port Etienne, Dakar, Konakry, Monrovia, Grand Bassam, Lagos, and St. Isabel Bay. The two other pilots were Capts. Antonio Llorente and Ignacio Jimenez, and each machine carried in addition two other officers and a mechanic.

Air Vice-Marshal Longcroft Injured

AIR VICE-MARSHAL C. A. H. LONGCROFT was involved in a motor car accident on December 21, and as a result was seriously injured. He was being driven to London from Bentley Priory, Stanmore (H.Q., R.A.F. Inland Area) when another car coming from the direction of London collided with his car at Edgware. Both cars were badly damaged, and subsequently, the driver of the car which collided with the R.A.F. car was charged at Hendon Police Court of being drunk while in charge of a motor car and with driving in a dangerous manner; he was remanded, on bail, for a week.

Big Flights for the New Year

THE year 1927 will probably see several big flights launched. Marquis de Pinedo, the famous Italian pilot, proposes to start on a flight round the world at the end of January; Comm. Franco, the Spanish pilot who flew from Spain to Buenos Aires, is also contemplating a flight round the world. France's effort will consist of a flight by two military airmen, in a Potez 28 (500 h.p. Farman), from Paris to Dakar, Buenos Aires, Panama, New York, and thence to Paris. Great Britain will also make an attempt at a big flight next year, for it is rumoured that Capt. F. T. Courtney is planning a dash to New Zealand in a multi-engined flying-boat, flying by night as well as day.

French Madagascar Flight

COMMANDANT DAGNAUX, the third of the French pilots to attempt a flight from France to Madagascar, arrived in his Breguet XIX A-2 (Renault) at Leopoldville on December 22. He left Le Bourget on November 28.

U.S. Army Pan-American Flight.

ON December 21, five Loening amphibians (400 h.p. Liberty) of the U.S. Army Air Service, under the command of Major Herbert A. Darque, set out from Kelly Field, San Antonio, Tex., on the first stage of a 20,000-mile "Pan-American" flight round South America. During this tour they will proceed down the west coast of South America to Chile, thence over the Andes to Bahia Blanca, Buenos Aires, and back up the east coast.

LIGHT 'PLANE CLUB DOINGS

The Lancashire Aero Club

FLYING report for week ending December 25.—Flying has only taken place on three days, as the aerodrome has been closed for holidays during the remainder of the period. Total flying time, 9 hrs. 45 mins., made up as follows:—

Dual with Messrs. Brown and Cantrill: Messrs. Birley, 1 hr. 15 mins.; Abdulla and Fallon, 55 mins. each; Wade, 40 mins.; Dickinson, 35 mins.; Anderson, 30 mins.; Miss Brown, 30 mins.; Messrs. Nelson and Leigh, 20 mins. each; Goodyear, Hardy and Forshaw, 10 mins. each; Twemlow, 15 mins.

Solo: Lacayo, 25 mins.; Birley, 15 mins.

Joy rides: With Mr. Scholes—Mr. James, 25 mins.; with Mr. Brown—Mr. James, 15 mins.; with Mr. Costa—Mr. Sampedre, 20 mins.

Test flights: 1 hr. 20 mins.

Mr. Birley went solo on Tuesday and put up a good show.

On the following day two members of the club, Messrs. Bert Hinkler and John Leeming, landed an Alpha-Gosport on the summit of Helvellyn. They were greeted by a Greek professor and left again almost immediately.

In view of the widespread public interest aroused by this flight one feels that a hitherto unpublished account of another daring landing should now be made known. Some little time ago those indomitable Lancashire bird-men, Messrs. Becayo and Lanson, put a club Moth down on the sands at Birkdale and the following intimate narrative is now given to the public: "As we left Woodford aerodrome on our pigmy aero-foil the sun was shining brightly in the South of England. Striking westward through a dense fog, and steering our course by means of canals and gasometers, we at last reached Southport and, after doing three figures of eight, to show local authorities that we had taken our "A" licence, we glided down towards the Birkdale sands. Barely 200 yards to our left towered the rugged sandhills, while on our right the cruel waves of the sea, which was at high tide, lashed the sands at a distance of not more than 2 miles. As we neared the ground we passed over several wicked-looking lumps of seaweed, while the whole shore was strewn with broken sea-shells. As we landed the 'bumps' were so terrific that had our heads not been screwed on exceptionally firm we must inevitably have lost them. Our landing was observed by several gentlemen in the neighbourhood, one of whom wrote out a certificate and sent it to the chairman. This was unfortunate, as it got us into a spot of trouble with the flying sub-committee."

It appears to us that we, the correspondent, will also be getting into a spot of trouble if we say much more, so we will be serious for a moment and offer our heartiest congratulations on their achievements to everyone concerned. In case this should not pacify them we would add that we shall be out of England by the time this appears, and propose to remain there for some time and have taken adequate precautions for the protection of our wife and children during our absence

P.S.—We note the Hampshire Club's suggestion of last week. We think very highly of the Hampshire Club, and are grieved that they should have such a low opinion of us as to suppose that we would lend them half-a-crown!

The Newcastle-upon-Tyne Aero Club, Ltd.

REPORT *for week ending December 26.*—Total, 7 hrs. 7 mins. 4 hrs. 37 mins. Moth, 2 hrs. 30 mins. Avro.

Dual, 2 hrs. 10 mins.; solo, 2 hrs. 5 mins.; tests, 22 mins.

The following members had instruction with Mr. J. D. Parkinson: Messrs. Turnbull, J. M. Kennedy, Stawart.

Mr. J. D. Irving flew solo twice on Sunday. Mr. C. Thompson with Mrs. Heslop. Mr. R. N. Thompson took up several passengers.

The Avro was in great demand on Sunday—the first time, with the exception of some tests, that it has been flown since arriving.

Mr. W. Baxter Ellis flew with Mrs. Ellis and Master Herbert Ellis, Mr. W. H. Leete, and Mr. J. M. Kennedy; Mr. H. H. Leech with Mr. G. Holmes and Mr. P. Holmes; Mr. J. D. Parkinson with Mrs. and Miss Tiley, Miss Keen, Mr. M. G. Thirlwell, Mr. Ogdon, Mr. Robson, and Mr. Jennings.

The engines of the Moth and the Avro have both been changed during the week, so that the machines were ready for work during the holidays. L Y *will be ready for delivery about January 20.*

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

December 30, 1926

CONTENTS

OUR CONTRIBUTORS

This issue of THE AIRCRAFT ENGINEER is mainly in the form of a series of reflections on the machines exhibited at the Paris Aero Show, which has just concluded.

Mr. J. D. North has for once abandoned his series of articles on "Aircraft Performance," and has instead devoted his attention to some impressions of the show. His opening remarks should, we think, be kept in mind in reading some of the criticisms which he has to offer. There is undoubtedly a tendency to look with distrust upon something with which one is unfamiliar, something in our nature that, in a slightly different form, caused the saying "who is 'e ? A Foreigner ! 'Eave a brick at 'im." Not that we would suggest for one moment that Mr. North is "'Eaving bricks." In point of fact, we think it will be agreed that he is treating his subject in a most sympathetic manner, and is obviously greatly concerned to be scrupulously fair, earnestly trying to get at the fundamental reasons underlying much that may seem to us obscure or incomprehensible.

It will be noted that Mr. North has seen something at the Paris Show which has pleased him a good deal, chiefly the skill in forging displayed by the Forges Foulain, an example of whose work is the Breguet spar box of forged duralumin. There is no doubt that this is a very fine specimen of the forger's art, and it might be difficult to get it made in this Country, but the question that one naturally asks is whether it is really necessary.

Another point in Mr. North's article which deserves attention is the reference to the channel-section duralumin construction on the S.I.M.B. (Bernard) single-seater fighter, type 12 C.1. This machine made a belated appearance at the show, and may have been missed by early visitors. It is a development of a "freak" racer exhibited at a previous show, and has multispar wing construction. Personally we cannot quite share Mr. North's appreciation of this form of construction, although we do agree that the production of tapered strip duralumin may open up a wide field for development.

Major F. M. Green also deals with tendencies of design at the Paris show, and to some extent his views appear to tally with those expressed by Mr. North. He points out what seems to us a fundamentally important difference between British and French policy, ours being based upon the possibility of repair, while the French appears to be based upon that of replacement. This is a fact that may help a very great deal to throw light upon, and even to explain altogether, such differences in methods as will have been observed.

THE PARIS AERO SHOW.

Some Impressions.

By J. D. NORTH, F.R.Ae.S.

The critical appreciation of foreign engineering products is a task of considerable difficulty. They are as much indigenous as cooking or dress, and arouse easily enough the innate xenophobian instincts which to a greater or lesser degree pervade the human race. To see something different arouses incredulity and even hostility. A writer on psychology has termed this innate hostility to novelties "alexic" (αλεξειν), because it arises from a train of thought which conveys to the mind some danger of disturbance to its preconceived opinions and to the personality some risk to its reputation, established or otherwise. So was Wagner hissed and Picasso ridiculed; not as foreigners in a national sense, but men of strange ways in their profession.

We ought to put severely out of our minds the idea that our methods are necessarily generally applicable or even, (if it be possible to do so), that they are right. The statement that an engineering product is difficult to make, often on analysis is found to mean that the critic does not know how the product may be or is made, and his criticism is purely a subconscious alexic impulse. Although I have outlined the pitfalls that beset the critic I have not much confidence in my ability to avoid them in giving a critical appreciation of the *Salon de l'Aeronautique*.

Considering first the question of general arrangement one should find here indication of some definite logical purpose to attain, either special aerodynamic advantages, economic structure, manufacturing economy, or special facilities for military functions such as good views, free arcs of gun fire, etc. One very characteristic type of structure arrangement is shown in Fig. 1, types of which are seen in the Nieuport-Delage, 42 C. and 48 C., and in the Bréguet type 19 and 26 T. A special feature of this arrangement is that in order to obtain a favourable angle for the lift wires or corresponding structure these wires are attached to the undercarriage. In the case of the Bréguet, a very considerable relief of the compression in the top wing spars is obtained in this manner, while in the Nieuport 42 C. a small bottom plane exists to stabilise the long supporting strut to the principal parasol wing. The disadvantage of this type of structure, which offers certain undoubted economies from the point of view of weight, is the limitation placed upon undercarriage travel and the susceptibility of the whole wing structure to be damaged by bad ground conditions. As is well known, the shock-absorbing mechanism of the Bréguet machines is accommodated within the wheels,

which are of cast aluminium alloy. In the case of the Nieuport, the axle fairing, which is exaggerated almost to a small wing, is extended beyond the undercarriage supporting struts so that the shock-absorbing mechanism is carried in bending, and the wheels pushed out far enough to clear the diagonal strut. In the case of the 42 C.1, the wheel is also displaced forward in relation to the diagonal strut. It would appear to be almost impossible to associate this class of structure with the shock-absorbing capacity demanded by English custom. The elastic travel on these machines is ample for taxying purposes and for landing under reasonably favourable conditions; but the vertical velocity of descent with which they can deal is very small compared with that of average English practice.

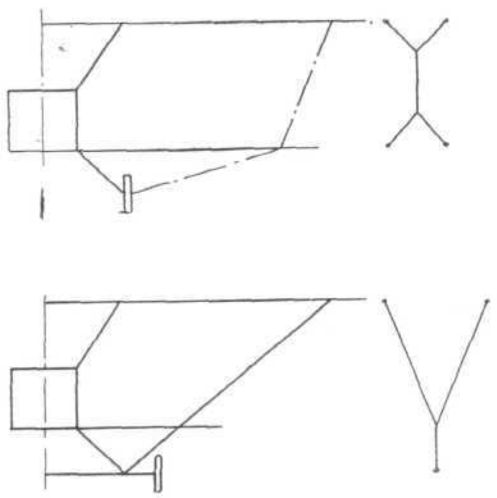


Fig. 1: Above, a diagrammatic representation of the wing bracing of the Breguet Machines. Below, that of the Nieuport-Delage 42.

Experience of undercarriages during the war did not lead to any conclusive evidence in favour of the replacement of elastically sprung undercarriages with small travel by hydraulic shock-absorbing devices, but post-war experience of the favourable influence on maintenance, of the more efficient type of shock-absorbing mechanism seems to indicate a real military and commercial advantage.

The alternative type of machine is a single-seater fighter with parasol wings, as exemplified in the Gourdou-Leseurre. In this case the supporting struts of the parasol are taken from the fuselage and the struts themselves are stabilised by additional structure, following in fact, the lines of the older Morane-Saulnier wing arrangement. This structure is not a light one, and would appear to offer a considerable resistance, but it undoubtedly gives to a pilot a very exceptional forward and downward view. An interesting comparison is obtainable between the Gourdou-Leseurre fitted with a "Jupiter" and one fitted with a Lorraine engine, a slight advantage in performance, particularly on climb and speed at height, being indicated for the former. Particulars of the comparative details of the two machines were given in FLIGHT of December 2. The internal arrangement of the cockpits of these machines is very compact and the bodies are small, but all the single-seater fighters appear to carry no electrical equipment for wireless or lighting, while the positions of the machine guns do not seem ideal from the point of view of accessibility. Whether these deficiencies are serious from a military point of view is a matter of opinion, but there is no doubt that they have greatly assisted in simple and compact body arrangement.

The Dyle et Bacalan, a twin-engined bomber, is constructed on lines which have already been tried, without conspicuous success, in the United States. The very thick section of middle wing on which the engines are mounted undoubtedly does afford ready engine accessibility, but such aerodynamical information as is available in respect of this type of installation indicates an abnormally large propeller interference.

The aeroplane as a structure can be interpreted in many varied forms, and its very versatility in this respect allows free rein to the imagination. It is probably true that quite a few aeroplanes are built in accordance with certain general arrangements in consequence of a "brain-wave" on the part of a designer, who produces a novelty without logically knowing the reasons for the arrangement which he adopts. In some cases the results are successful, and in others the type dies a natural death. There is probably more imagination used in the general arrangement of continental designs than in England, but if sometimes results indicate a stroke of genius there is by no means always any real engineering advantage.

The characteristic arrangement of most of the aeroplanes at the Salon requires a structure design to withstand very large bending, and in many cases comparatively slight compression loads. This has naturally had a definite influence on the type of spars adopted. The structure of the Bréguet '19 and the Nieuport C.21 was shown at the last exhibition two years ago. In the case of the monoplane, or "sesquiplane," the plain box girder of aluminium sheet with laminated flanges satisfactorily meets the requirements of heavy variation in bending moment. As in wings of this class deflection is very important, there will probably be little advantage in using a steel spar with undoubted added complications of manufacture. An example of a steel spar of similar type, intended, I believe, for the Dyle et Bacalan machine, is shown on the stand of a steel maker. The construction is of similar type to the spar already described; although the web has been lightened to an N girder, the absence of corrugation makes it necessary to use very thick material, and the spar must be heavy. Incidentally, a spar of similar type is shown in aluminium bronze, autogenously welded. Although this material is excellent from a corrosion point of view, it is hardly suitable for light structures on account of the low value of Young's Modulus and high specific gravity. The top wing spars of the Bréguet have bulbous booms riveted to a single plate web, the web being reinforced with pressed sections riveted on. The lower spars consist of built-up channel sections back to back, with a solid drawn tubular section over them roughly in the form of a figure-of-eight. Another characteristic feature of this type of machine is the member which connects the upper and lower planes, or the planes and the undercarriage in the case of the monoplane or "sesquiplane." In the Nieuport machines two huge "Y"-formed sheets of Duralumin are pressed out and riveted together to form a branching strut of streamline section riveted along its fore and aft edges, apparently without internal support, the shell being sufficiently strong in itself. In the case of the Bréguet strut, which is in the form of a double "Y," an elaborate internal channel structure is used to support the shell, the four ends of the double "Y" terminating in ball and socket joints. It would appear that the labour involved in dealing with the large amount of not very accessible riveting on the Bréguet strut must make is a very much more expensive manufacturing proposition than the Nieuport.

One must examine constructional details in the light of one's own ideas as to the economic lines of structural development. In order that metal construction may be sufficiently flexible to adapt itself to different sizes and types of aeroplanes, it is necessary that it should be constructed to allow for changes in the sizes of the aeroplane or the design. For example, my own firm—Boulton and Paul, Ltd.—have been for some time past concentrating their attention on the realisation of a manufacturing system, the elements of which shall be adaptable to aeroplanes of biplane construction of 2,000 to 20,000 lbs. gross weight, and in which there shall be enough common features between the elements of various sizes to reduce the tool equipment and use of skilled labour to a minimum, to keep down the number of different parts on different aeroplanes and to simplify the problem of maintenance and repair, the principle of which would, in common with the constructional system, pass from one aeroplane to another. It is difficult to see in the Salon any signs of a similar endeavour.

A very complete exhibition is given by the Section Technique of the methods of manufacture of the Bréguet '19. Here is an aeroplane which, with a good performance, has some remarkable records to its credit, and which, having been

made in large quantities has been produced at a very reasonable cost. The tooling up of the job appears, however, to be uniquely associated with that particular aeroplane. One notices particularly in the construction of both spars and ribs, and in fact, all the elements of the wings, an enormous amount of riveting, much of which does not lend itself too well to mechanical execution. It is particularly interesting, insomuch as experience leads us to believe that such a feature has an important bearing on cost, to know that in spite of the work involved the machine has still been economically

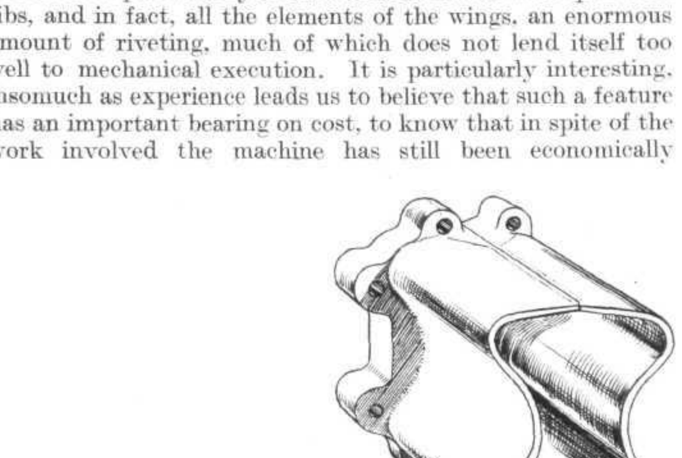


Fig. 2: Details of the forged Duralumin spar box of the Breguet 19: The faint lines in the lower sketch give an idea of the manner in which the part was forged.

produced. A very liberal use of light alloy stampings is found in the Bréguet construction, and some of these stampings are remarkable examples of the drop stamper's art, notably the stampings shown in Fig. 2, the two halves of which go to form the joint between the bottom spar and the top, being riveted together on the two sides of the figure-of-eight section tube. The corrugated part of the stamping tapers down from the lugs from about 3 mm. thick to 2 mm. thick. One might have suspected that the examples of this article which were exhibited were specimens specially made for show purposes, but on examination of the way in which this stamping is used on the actual construction of the Bréguet wings, it is evident that an extraordinarily high standard of stamping accuracy in a very difficult part has been achieved. This is only one of many examples of light alloy stampings on the Bréguet, and their profusion, notably in the rear fuselage joints which contain three fairly large stampings at each joint, is evidence that they must be produced very economically. The exhibit of the Forges Foulain would seem to indicate that the art of the drop stamper in the manipulation of light alloys has advanced in France to a high pitch. We have here an opportunity for valuable technical development. Some of the alternative types of joint construction to these stampings which are seen on various aeroplanes exhibited are not very pleasing. Where Bréguet has had to make joints which it has not been possible to stamp, the duralumin struts are fitted into welded steel sockets. Welded steel fittings are also used in the elevators, for example, to attach the ribs to the tubular spars and to the leading edge. One presumes that no trouble has been experienced, but the solution of the problem of attaching these members seems unnecessarily crude without being the most economical. In the construction of the S.E.C.M. 150 T some most remarkable examples of complicated tube joints made up from sheet are to be seen. The press work involved in these joints must be extraordinarily difficult and expensive, and there are a very large number of different joints on the aeroplane, while the fittings, owing to the varying angles and numbers of struts which they house, could not possibly have a general application. It is interesting to note that in some cases the difficulty of getting in the last member has caused the designer to close the socket with an aluminium block as in Fig. 3, using a stupendous number of small bolts for the purpose. Both in this case and in the large number of small split-pinned bolts in each fuselage joint on the Bréguet, there would seem to be inevitably heavy assembly costs. Presumably all these machines are designed on the assumption that they will go into production on such a large scale that the complete tooling up for any individual design is justified.

There are one or two examples of metal covered wings, the Wibault, a straightforward construction on Dornier lines, and the Avimeta which seems to be an offspring of the large twin fuselage Schneider shown at the last exhibition, and a metal monoplane exhibited by the S.I.M.B., which is of considerable technical interest, the wings being constructed of channel sections running parallel to the span of the machine, turned inwards and riveted together on their inner edges after the manner of the Bréguet cowling. An exhibit on the Duralumin stand of strip up to 8 ins. wide and 18 ft. long, tapering from 12 to 18 gauge along its length, enables one to appreciate how such a structure can be made economically. In the wings the channels are parallel to one another, while assembly panels are fitted to the underside of the wing to enable the riveting work to be completed, and to give accessibility to the interior of the structure. A similar constructional arrangement is used for the body, but with the streamline form the channels are no longer parallel and, consequently, must be more expensive to produce. The possibility of obtaining taper strip as a commercial proposition opens up a wide field of technical development. It is not possible to say whether this taper strip was actually used in the S.I.M.B., but it would be safe to say that if it was not it soon will be.

Besides the steel spar already referred to exhibited by Messrs. Jacob Holtzer, there is also shown on their stand a number of drawn corrugated sections of heat-treated nickel-chrome steel. This material is of a similar class (3 per cent. nickel, 1 per cent. chrome) to that which is generally used for steel construction in this country, but the sections are of much thicker material than we are accustomed to, and the corrugations are of a very slight nature. It is understood that Messrs. Holtzer are pursuing their experiments with regard to corrugated steel spars. On the Dyle et Bacalan machine there are a number of built-up steel box struts of the type shown in Fig. 4, but, as one would expect from this type of section, the steel is of about 18 gauge in order to avoid local buckling. The design, in fact, strikes one as very crude and heavy. It is impossible to believe that such members

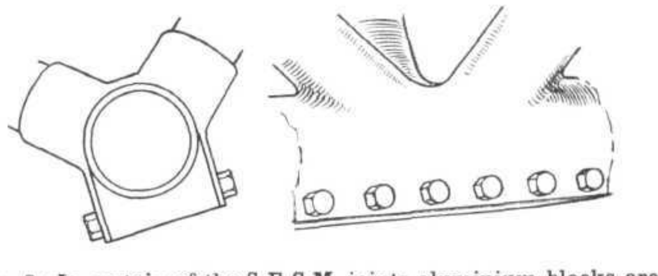


Fig. 3: In certain of the S.E.C M. joints aluminium blocks are used to close the socket, numerous bolts being used.

can compare favourably with steel tubes of appropriate material. Steel construction is also illustrated in the Fiat machine, on which the two halves of the spar have been pressed out into a channel section and riveted together as in Fig. 5, the spars being lightened in the web by perforations which, incidentally, give access for the riveting operation. Here again the thickness of the material rendered necessary by the nature of the design would suggest that the spar is uneconomically heavy compared with modern English practice. The accessibility to the top and bottom parts of the spar allowed by the perforation of the webs is also used to permit the ribs to be riveted directly on to the spars, a type of assembly which has been found rather expensive. Some of the light alloy ribs which were exhibited are made up from channel sections, a form of construction which in aluminium alloys has not been

(*Continued on p.* 108)

TABLE OF PARTICULARS OF AEROPLANES

Machine and Type.	Purpose.	Power Plant.	Wing Span.		Wing Area.		Weight Empty.		Weight Loaded.	
			m.	ft.	sq. m.	sq. ft.	kg.	lbs.	kg.	lbs.
.b. 11 Bi. ...	... 2-st. Reconnaissance	... 240 " Perun II "	... 12·78	(41·9)	36·51	(393)	1,027	(2,260)	1,534	(3,380)
·ong-Whitworth " Ajax "	2-st. Genl. Purpose Bi.	... 385 A.-S. " Jaguar "	12·0	(39·3)	35·5	(382)	1,018	(2,240)	1,680	(3,700)
ıeta " A.V.M. 88 Mono.	2-st. Recon. Fighter	... 500 Hispano-Suiza	... 17·0	(55·8)	40	(421)	1,550	(3,410)	2,400	(5,280)
·d 15 C. 14. Sesqui.	... Single-st. Fighter	... 500 Hispano-Suiza	... 11·4	(37·4)	24·5	(263·5)	—		1,800	(3,960)
. M.B. 35 Mono. ...	... Submarine Scout	... 120 Salmson (Air.)	... 9·85	(32·3)	16·5	(178)	540	(1,180)	765	(1,680)
. M.B. 36 Mono. ...	... 14-pass. Flying Boat	... 3-420 " Jupiter "	... 25·0	(82·0)	130	(1,400)	5,150	(11,300)	8,000	(17,600)
·-Spad 61 Bi. ...	... Altitude Record Machine	450 Lorraine (super.)	11·72	(38·4)	37	(398)	1,147	(2,520)	1,522	(3,350)
; 165. T Bi. ...	... 16-pass. Commercial	... 2-420 " Jupiter "	... 23·0	(75·4)	119	(1,280)	3,100	(6,820)	5,450	(12,000)
ıdy Avia B.H. 11 Mono.	... 2-st. Light Plane ...	... 60 Walter ...	... 9·72	(31·9)	13·6	(146)	352	(773)	580	(1,280)
ıdy Avia B.H. 26 Bi.	... 2-st. Fighter ...	... 420 " Jupiter "	... 10·8	(35·5)	31·32	(337)	1,060	(2,165)	1,700	(3,740)
guet 19 G.R. Sesqui.	... 2-st. Long Dist. Recon.	... 500 Hispano-Suiza ...	—		52·75	(568)	1,518	(3,335)	4,157	(9,140)
guet 19 H. Sesqui.	... 2-st. Recon. Seaplane	... 450 Lorraine	... 14·83	(48·6)	50·0	(538)	1,350	(2,970)	2,450	(5,380)
·guet 26 T. Sesqui.	... 6-st. Commercial	... 420 " Jupiter " ...	—		55·0	(592)	—		2,825	(6,220)
.S. 37 A. Boat Bi.	... 3-st. Flt. Spot. Amph.	... 450 Lorraine	... 14·5	(47·5)	58·0	(624)	2,000	(4,400)	2,900	(6,380)
ɔn C. 104 G.R. Sesqui.	... 2-st. Long Dist. Recon.	... 420 " Jupiter "	... 14·56	(47·8)	44·0	(474)	1,377	(3,030)	1,965	(4,320)
ɔn C. 59 Bi. ...	... 2-st. School ...	... 180 Hispano-Suiza	... 10·25	(33·6)	26·0	(280)	700	(1,540)	1,000	(2,200)
ɔn C. 168 Bi. ...	... 2-st. Touring ...	... 60 Salmson ...	... 9·0	(29·5)	20·0	(215)	—		584	(1,286)
ɔn C. 109 Mono.	... 2-st. Touring ...	... 40 Salmson ...	... 11·5	(37·7)	20·0	(215)	—		555	(1,220)
nps 17 A. 2 Sesqui.	... 2-st. Fighter ...	... 450 Lorraine	... 9·35	(30·7)	42	(452)	1,238	(2,720)	2,046	(4,500)
n F. 160 B.N. Bi.	... Night Bomber ...	... 2-500 Farman	... 26·75	(87·8)	200	(2,150)	4,000	(8,800)	7,000	(15,400)
n F. 170 T. Mono.	... 8-pass. Commercial	... 500 Farman ...	... 16·1	(52·8)	52·5	(565)	2,018	(4,430)	3,318	(7,300)
r C.VD. Sesqui. ...	... 2-st. Fighter ...	... 450 Hispano	... 12·5	(41·0)	28·8	(310)	1,290	(2,840)	1,890	(4,160)
r F. VII-3m. Mono.	... 8-pass. Commercial	... 3-185 Armst. Sid. " Lynx "	19·3	(63·3)	58·5	(630)	2,150	(4,730)	3,600	(7,920)
ɔt H. 35 Mono. ...	... 2-st. Training ...	... 180 Hispano-Suiza	... 11·4	(37·4)	22·0	(237)	600	(1,320)	950	(2,090)
ɔt H. 41 Bi. ...	... 2-st. Training Seaplane	... 120 Salmson	... 10·26	(33·6)	34·9	(376)	725	(1,600)	1,000	(2,200)
ɔt H. 14 S. Bi. ...	... 1-pass-Ambulance	... 80 Le Rhone	... 10·26	(33·6)	34·9	(376)	—		790	(1,740)
oven F.K. 35 Mono.	... 2-st. Fighter ...	... 480 " Jupiter "	... 11·5	(37·7)	24·0	(258)	900	(1,980)	1,540	(3,390)
seur "Avion Marin " Bi.	3-st. Flt. Recon. ...	... 450 Lorraine	... 14·6	(47·8)	60	(646)	1,550	(3,410)	2,400	(5,280)
seur VI C. 2 Bi. ...	... 2-st. Fighter ...	... 500 Hispano-Suiza	... 12·2	(40·0)	40	(431)	1,200	(2,640)	1,986	(4,370)
seur 7T. Bi. ...	... 6-pass. Commercial	... 420 " Jupiter "	... 14·5	(47·5)	60	(646)	1,550	(3,410)	2,700	(5,940)
& Olivier LeO 21 Bi.	... 18-pass. Commercial	... 2-420 " Jupiter "	... 22·76	(74·6)	106·5	(11,470)	2,690	(5,920)	5,500	(12,100)
& Olivier LeO 19 Bi.	... 6-pass. Com. Fl.-Boat	... 420 " Jupiter "	... 16·0	(52·5)	64·2	(692)	1,700	(3,740)	3,200	(7,040)
Gourdou-Leseurre LGL 32 10.	Single-seater Fighter	... 420 " Jupiter "	... 12·2	(40·0)	25·0	(269	963	(2,120)	1,370	(3,010)
ıe-Saulnier 129 Mono.	... 2-st. Training ...	... 180 Hispano-Suiza	... 10·7	(35·1)	19·7	(212)	740	(1,630)	1,045	(2,300)
ıe-Saulnier 132 Mono	... 2-st. Touring ...	... 120 Salmson	... 10·7	(35·1)	19·7	(212)	655	(1,440)	930	(2,045)
ıe-Saulnier 35 Mono.	... 2-st. Training ...	... 80 Le Rhone	... 10·56	(34·6)	18·0	(194)	450	(990)	700	(1,540)
·rs des Mureaux 3 C.2 Mono.	2-st. Fighter ...	... 500 Hispano-Suiza	... 15·0	(49·2)	32·5	(350)	1,170	(2,575)	1,990	(4,180)
ɔort-Astra 42 C. 1 Sesqui.	Single-seater Fighter	... 500 Hispano-Suiza	... 12·0	(39·4)	31·75	(342)	1,379	(3,030)	1,808	(4,140)
ɔort-Astra 48 C. 1 Mono.	Single-seater Fighter	... 400 Hispano-Suiza	... 10·0	(32·8)	19·38	(209)	1,032	(2,270)	1,290	(2,840)
ɔtez 25 A. 2 Sesqui.	... 2-st. Army Co-op.	... 450 Lorraine	... 14·0	(45·9)	46·7	(502)	1,210	(2,660)	1,998	(4,380)
ɔtez 25 G.R. Sesqui.	... 2-st. Long. Dist. Recon.	... 450 Lorraine	... 14·0	(45·9)	46·7	(502)	1,220	(2,682)	2,365	(5,200)
ɔtez 28 G.R. Sesqui.	... 2-st. Long. Dist. Recon.	... 550 Renault	... 16·2	(53·2)	63·0	(688)	1,900	(4,180)	4,770	(10,480)
son-Bechereau C. 2 Sesqui.	2-st. Fighter ...	... 500 Salmson	... 14·6	(52·8)	35·0	(377)	1,558	(3,430)	2,360	(5,180)
son-Bechereau Mail Bi.	... 7-pass. Commercial	... 500 Salmson	... 16·9	(55·4)	60	(646)	1,840	(4,050)	3,520	(7,740)
·ck-F.B.A. 21 Bi. ...	... 4-pass. Com. Fl.-Boat	... 450 Lorraine	... 15·4	(50·5)	53·5	(576)	1,820	(4,000)	2,840	(6,240)
·.M. 120 B.N. 2 Bi.	... 2-st. Night Bomber	... 600 Renault	... 19·0	(62·3)	85·0	(915)	1,760	(3,870)	3,400	(7,470)
·.M. 150 T. Mono.	... 14-pass. Commercial	... 3-350 Hispano	... 23·9	(78·4)	100	(1,076)	4,030	(8,875)	7,300	(16,040)
lliers II Sesqui. ...	... 2-st. Navy Fighter	... 450 Lorraine	... 13·0	(42·6)	40·0	(431)	1,565	(3,445)	2,050	(4,500)
lliers V Sesqui. ...	... 2-st. Night Fighter	... 450 Lorraine	... 12·0	(39·4)	40·0	(431)	1,274	(2,800)	2,105	(4,635)
ıska S. 16 Bi. ...	... 2-st. Long. Dist. Recon.	... 450 Lorraine	... 15·5	(50·8)	47·0	(506)	1,200	(2,640)	2,250	(4,900)
ıska S. 18 Bi. ...	... 2-st. Training ...	... 60 Walter ...	... 10·0	(32·8)	17·0	(183)	254	(558)	554	(1,216)
ıult 7 C. 1 Mono. ...	... Single-seater Fighter	... 420 " Jupiter "	... 11·0	(36·1)	22·2	(239)	827	(1,818)	1,444	(3,175)

XHIBITED AT THE PARIS AIR SHOW, 1926.

ower Loading.		Wing Loading.		Span²/W	"Wing Power."		Max. Speed, Ground Level.		Climb.	Ceiling.		High-speed	Altitude
/h.p.	lbs./h.p.	kg./sq.m.	lbs./sq.ft.		hp./sq.m.	h.p./sq.ft.	km./h.	m.p.h.	Alti. (m.) mins.	m.	ft.	Figure.	Figure.
·40	(14·1)	42·0	(8·60)	0·52	6·56	(0·61)	215	(130)	5,000 in 19·3	7,600	(24,900)	27·0	9·4
·36	(9·6)	47·3	(9·68)	0·42	10·85	(1·01)	225	(140)	5,000 in 24	6,000	(19,700)	19·2	5·1
·80	(10·6)	60·0	(12·55)	0·59	12·50	(1·19)	240	(149)	5 000 in 16	7 500	(24,600)	20·0	8·5
·60	(7·92)	73·5	(15·0)	0·35	20·40	(1·90)	270	(167·6)	5,000 in 12·5	7,500	(24,600)	19·5	7·0
·37	(14·0)	46·3	(9·43)	0·62	7·26	(0·67)	163	(101)	2,000 in 12	4,200	(13,800)	10·8	5·2
·34	(13·97)	61·5	(12·6)	0·36	9·68	(0·90)	180	(112)	—		—	11·0	—
·38	(7·45)	41·2	(8·42	0·44	12·2	(1·13)	283	(176)	—	12,442	(40,800)	34·5	*
·49	(14·3)	45·7	(9·38)	0·47	7·06	(0·66)	180	(112)	—		—	15·0	—
·66	(21·3)	42·6	(8·77)	0·75	4·41	(0·41)	160	(99·5)	2,000 in 12	4,000	(13,120)	17·0	7·5
·05	(8·9)	54·3	(11·1)	0·34	13·4	(1·24)	240	(149)	5,000 in 20	7,000	(23,000)	18·5	6·1
·32	(18·3)	78·8	(16·1)	—	9·47	(0·88)		—	—		—	—	—
·44	(11·9)	49·0	(10·0)	0·44	9·00	(0·84)	200	(124)	4,000 in 30	5,600	(18,350)	16·0	6·0
·72	(14·8)	51·4	(10·5)	—	7·64	(0·71)	204	(127)	—		—	19·5	—
·44	(14·2)	50·0	(10·2)	0·35	7·76	(0·72)	170	(115)	3,000 in 35	4,000	(13,120)	11·5	5·4
·68	(10·3)	44·6	(9·12)	0·53	9·55	(0·89)	209	(130)	5,000 in 28·8	6,375	(20,900)	16·5	5·6
·5	(12·2)	38·5	(7·86)	0·52	6·92	(0·64)	180	(112)	—		—	15·2	—
·74	(21·4)	29·2	(5·98)	0·67	3·00	(0·28)	142	(88·2)	—	3,200	(10,500)	17·5	5·3
·87	(30·5)	27·7	(5·67)	1·16	2·00	(0·19)	125	(77·7)	—	2,600	(8,525)	18·5	6·6
·54	(10·0)	48·7	(9·95)	0·21	10·7	(0·99)	230	(143)	5,000 in 24·9		—	20·5	—
·0	(15·4)	35·0	(7·16)	0·50	5·00	(0·46)	186	(116)	4,000 in 30	6,000	(19,700)	23·0	7·0
·64	(14·6)	63·2	(12·9)	0·38	9·52	(0·88)	202	(125)	3,000 in 27·4	4,300	(14,100)	15·5	6·5
·20	(9·25)	65·6	(13·4)	0·41	15·6	(1·45)	255	(158)	5,000 in 17	6,700	(22,000)	19·0	6·7
·6	(14·3)	61·5	(12·6)	0·51	9·49	(0·88)	185	(115)	3,000 in 22·2	4,700	(15,400)	12·3	6·9
·27	(11·6)	43·2	(8·82)	0·67	9·18	(0·76)	207	(128)	—	6,500	(21,300)	17·0	6·5
·33	(18·3)	28·7	(5·85)	0·51	3·44	(0·32)	120	(74·5)	—		—	9·5	—
·88	(21·7)	22·6	(4·63)	0·65	2·29	(0·21)	120	(74·5)	—	4,000	(13,120)	13·8	5·4
·21	(7·05)	64·2	(13·1)	0·42	20·0	(1·86)	260	(161)	5,000 in 14		—	15·6	—
·33	(11·7)	40·0	(8·17)	0·43	7·50	(0·70)	185	(115)	3,000 in 20	5,500	(18,000)	15·0	5·2
·98	(8·75)	49·7	(10·1)	0·37	12·5	(1·16)	215	(134)	—	7,500	(24,600)	14·3	6·3
·43	(14·1)	45·0	(9·2)	0·38	7·00	(0·64)	180	(112)	—		—	15·2	—
·55	(14·4)	51·6	(11·4)	0·46	7·92	(0·73)	192	(119)	—		—	16·3	—
·62	(16·8)	49·9	(10·9)	0·39	6·54	(0·61)	170	(106)	—		—	17·0	—
·26	(7·17)	54·8	(11·2)	0·53	16·8	(1·56)	250	(155)	5,000 in 12	9,750	(32,000)	16·5	8·5
·81	(12·8)	53·1	(10·8)	0·54	9·13	(0·85)		—	—		—	—	—
·75	(17·0)	47·2	(9·65)	0·60	6·09	(0·57)		—	—		—	—	—
·75	(19·2)	38·9	(7·94)	0·78	4·44	(0·41)		—	—		—	—	—
·98	(8·37)	61·2	(11·9)	0·58	15·4	(1·43)	245	(152)	—	8,600	(28,200)	17·0	8·6
·62	(8·28)	57·0	(12·1)	0·37	15·7	(1·46)	267	(166)	5,000 in 13·05	8,000	(26,200)	22·0	6·8
·23	(7·10)	66·5	(13·6)	0·38	20·6	(1·91)	275	(171)	6,500 in 40·23		—	18·0	—
·44	(9·74)	42·8	(8·73)	0·48	9·63	(0·87)	217	(135)	5,000 in 20·35	7,400	(24,300)	19·0	6·4
·26	(11·6)	50·6	(10·4)	0·41	9·63	(0·87)	215	(134)	—	5,800	(19,000)	18·5	6·
·68	(19.1)	75·7	(15·2)	0·27	8·73	(0·80)	200	(124)	—	2,500	(,200)	16·5	*
·72	(10·4)	67·4	(13·7)	0·53	14·3	(1·33)	220	(137)	5,000 in 20·2	7,150	(23,500)	13·3	8·2
04	(15·5)	58·7	(12·0)	0·40	8·33	(0·77)	190	(118)	—		—	15·0	—
31	(13·9)	53·1	(10·8)	0·41	8·41	(0·78)	186	(115)	4,000 in 56	4,400	(14,430)	14·0	5·8
7	(12·4)	40·0	(8·16)	0·52	7·06	(0·66)	200	(124)	4,000 in 28·5	5,500	(18,000)	21·0	5·5
5	(15·9)	73·0	(14·9)	0·38	10·5	(0·98)	235	(146)	—	4,800	(15,750)	22·0	8·1
56	(10·0)	51·3	(10·4)	0·40	11·2	(1·04)	218	(135)	6,000 in 29	6,250	(20,500)	16·0	5·8
68	(10·3)	52·7	(10·7)	0·34	11·2	(1·04)	224	(139)	6,500 in 43		—	18·0	—
[illegible]	(11·0)	47·9	(9·77)	0·52	9·58	(0·89)	225	(140)	—	6,500	(21,300)	20·8	6·5
24	(20·3)	32·6	(6·64)	0·88	3·53	(0·33)	140	(87·0)	1,000 in 6	3,500	(11,500)	14·0	5·5
44	(7·56)	65·0	(13·3)	0·41	18·9	(1·76)	222	(138)	5,000 in 15·3	8,500	(27,900)	10·5	7·7

* Falls outside graph.

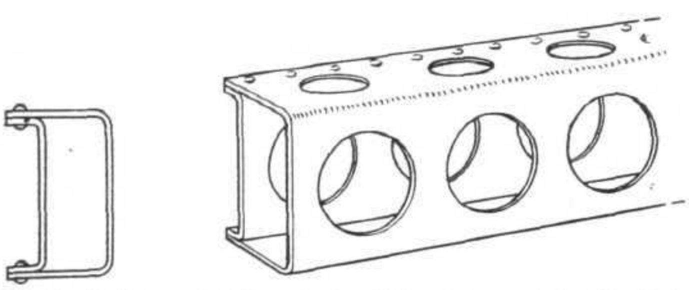


Fig. 4: Built-up steel box struts of the type used in the Dyle et Bacalan DB 10.

found to be very satisfactory from the point of view of vibration. In many cases there is evidence of considerable elaboration of the joints, possibly due to difficulties which have been experienced in this direction. In the case of the Fiat, square section tubes of very light gauge are used, a form that is expensive and necessitates elaborate jointing.

Some very fine examples of die castings in the light alloy, marketed under the name of "Alugir," which appears to be of the type of "Y" alloy (4 per cent. copper, 2 per cent. nickel, and 1½ per cent. magnesium) are shown. The company exhibiting these (*Etablissements Metallurgiques de la Gironde*) confine their foundry operations in this class of material to die castings, with the exception that in certain cases sand cores are used for pistons. The die casting in this class of material, judging from characteristic prices of work exhibited, has been brought to a very economical stage of manufacture, both as regards the dies and the articles themselves. Many of the parts exhibited were for railway work, but die casting is useful in aeronautical work, and with light alloys in particular there is no doubt that there is a very substantial gulf separating die castings from sand castings as a satisfactory engineering product, principally due, I think, to the chilling. Castings in materials of this type can be heat-treated and give very favourable mechanical properties. Some equally good examples of drop forgings are also to be seen made from this material, whilst it is stated by the stampers to be slightly more plastic at forging temperatures than the duralumin class; but there does not seem to be anything to choose between the appearance of the finished products in either class of material. On the duralumin stand, besides the remarkable exhibit of taper strip, there are some very large examples of solid-drawn tube work, which would seem to indicate that the French company must cast very large ingots. There are also some fine examples of forgings for propellers (see Fig. 6). Given the possibility of obtaining forgings of this type at a reasonable price—and the figures quoted were certainly quite commercial—the problem of the metal propeller resolves itself really into one of machine generating, which is by no means new and certainly not insoluble. The examples of propellers machined from these forgings were not very good from an aerodynamic point of view, nor, except for the show exhibits on the Duralumin stand, did they appear to be very well machined. The prices stated for machining operations were, however, very low, and it would seem that the development of satisfactory propellers on these lines cannot be very far distant. The machining on these propellers was, I believe, carried out by a copying operation from a wooden former, which seems a less satisfactory operation than the use of a proper generating machine. An extraordinarily large propeller forging was also shown on the Duralumin Company's stand, but a superficial examination led one to the conclusion that the boss was not entirely sound.

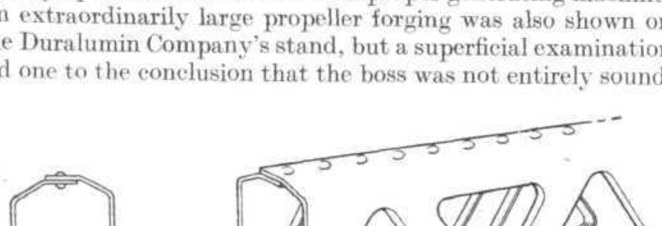


Fig. 5: Details of the Fiat wing spars.

It is, of course, quite natural that difficulties should be experienced with such very large forgings, even though smaller propellers required for ordinary aircraft are quite satisfactory.

In the matter of engine installation, particular interest naturally attaches to the installation of the "Jupiter" engine, of which there were very many examples. It is interesting to note that no machines were shown fitted with helmets although the rudimentary fairings on the Gourdou Leseurre are probably a token of that firm's earlier interest in helmeted cowling. Much of the cowl work seemed very flimsy and awkward to remove, and one would expect difficulties of maintenance in service, this is the more disappointing as French cowl work is usually so neat.

A very bold and simple arrangement is to be found on the Fokker stand where, by making use of a spinner on the propeller, the cowling is reduced to 9 plates, one between each cylinder, of 18 gauge thickness, not beaded in any way but lightly creased to give stiffness. Each of these plates sits on four bosses and is secured from jumping off the boss by a safety pin. This type of cowling fixing has, of course, been used by Fokker for some time, and even if it is rather shocking from an engineering point of view, would seem eminently practicable if it stands up to service.

These criticisms have been written some time after a visit to the Show, and without making any notes and without attempting to notice either everything that is good or everything that is bad. They are merely an endeavour to set out

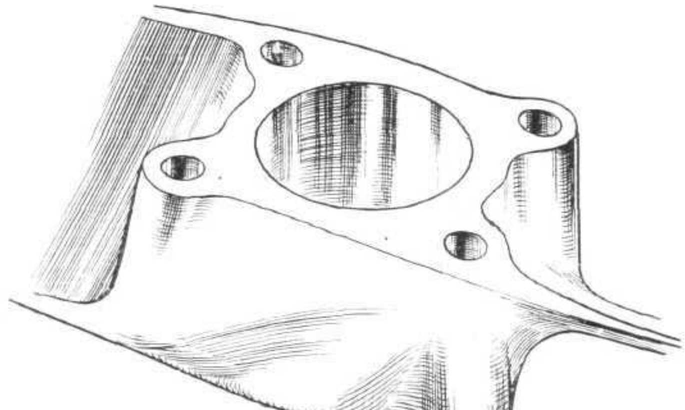


Fig. 6: Boss of forged Duralumin propeller, Comte patent.

for the information of others those points which appealed to me personally as an aeronautical engineer. The great advantage of exhibitions is that they make one think, since owing to the unfortunate secrecy which surrounds aircraft work due to its military nature, there is a grave danger of sections of the aeronautical community, if not individuals, becoming self-centred. Where the work of others is exhibited for our inspection and interest, we must always realise that some of the things we fail to appreciate, we may not understand. If we have a difficulty in reconciling, in the light of our experience, the costs of the manufacture of various types of metal construction with the work involved therein, and if we find a difficulty in understanding how machines of certain aerodynamical features give certain performances we ought to remember that one explanation may be that individually each of us still has a lot to learn.

TENDENCIES OF DESIGN AT THE PARIS SHOW.

By F. M. GREEN, M.Inst.C.E., F.R.Ae.S.

To my mind, the outstanding thing about an exhibition of aeroplanes is the tendency of almost everyone to judge the exhibits from one point of view only, which is "cleanness of design." We all know that the power taken by an aeroplane is made up of two parts—one dependent on resistance, the other on weight. It is the constant endeavour of the designer to decrease both. Unfortunately decreasing resistance has a strong tendency to increase weight, to say nothing of accessibility. At a show it is so easy to say that such an aeroplane is a very clean job, but much more difficult to

say whether it is a light or heavy job or whether, which is still more important, it is a strong and practical job for its weight. I do not mean that an aeroplane ought not to look well faired off, but that this quality must not be obtained at too great an expense in other qualities.

Greater attention to reduction of resistance is undoubtedly a tendency in design, though it is to be noted that wing surface radiators are entirely absent. There seems little doubt that in spite of the big saving in resistance that they make possible, weight and certain practical considerations have led to their disuse. There are many instances of aeroplanes beautifully faired, with large areas of sheet aluminium or duralumin. Beautiful as they look on a Show stand, they seem to me to be exaggerating one quality at the expense of weight and practicalness, and I expect to see a return to simpler design.

There is one very marked difference between continental design and our own, and this is in the travel of the landing gear. In England we have settled down to using a travel of 8 ins. to 10 ins., and to providing some sort of damping, usually by oil displacement. The average continental aeroplane has certainly not more than 3 ins. of this movement, almost always resisted by tensions rubber without other damping. It is obvious that the longer the travel the less is the shock to the machine in a bad landing, so either our neighbours must land much better than we do, or else they must make stronger frames and landing gear if they get the same life out of their machines as we do. I do not think our pilots are inferior in skill, but it is not unlikely that the size of the aerodrome has an influence. There is generally more room on the Continent, and the pilots take advantage of this to fly their aeroplanes on to the ground and avoid stalled landings. How they get on with tension rubber shock absorbers in tropical countries I do not know. Another thing that confirms the view that little attention is paid to flying and landing slowly, is the small size of the control surfaces. These are smaller all round than is the practice in this country, and the angular travel is distinctly less. At a rough average it looks as if all the controls are less than two-thirds as powerful compared with our own aircraft. Rudders are still very much on the small side, though they have shown a slight tendency to increase, and adjustable tail planes are almost entirely absent.

There is one curious result of the use of short travel landing gear. It has encouraged the design of wheels with large diameter hubs in which is a sliding mechanism with rubber shock absorbers. This allows the axle to be fixed, as in the Breguet XIX. In this aeroplane the designer has made full use of the fixed axle by attaching the main lift wires to it. This increases the effective depth of the structure of the wings, and reduces the end load in the spars considerably. Whether or not it is advisable to take the main bracing of the wings through the under-carriage is open to question, but there is no doubt that it helps to lighten the structure. Other designers have adopted the principle of the fixed axle but have not taken advantage of it in the same way.

There is no doubt that metal construction is becoming more and more popular. The French constructors use an aluminium alloy almost exclusively, generally duralumin. France is a great aluminium producing country and in time of war would have no difficulty in finding supplies, and no doubt this has an important influence. There is another and, I think, important factor that influences French design in one way and our English design in an opposite way. France is a compact nation without much responsibility abroad. The British Empire is world-wide. French aircraft are chiefly for use in or near to France and are never likely to be far from an organised aircraft factory. English aircraft are flown in countries where the users can only depend on themselves for upkeep. The result of these opposite requirements is that French aeroplane designers are not much troubled with questions of upkeep and repair and they have developed a construction which can be made only by specialised manufacturing methods. They prefer to replace rather than to repair. I think we can go even further than this and say that a French aeroplane is only expected to have a comparatively short life, even in peace time. I could find no attempt at protecting aluminium alloy from corrosion, even when in close contact with steel. Either our own authorities are unduly cautious or else deterioration with age is not considered.

In the actual use of material in construction there seems little or no advance since the Paris Show of two years ago. Then, as now, the Breguet XIX was the principal exhibit, and this appears to be unchanged. I certainly think that the Breguet spars could have been designed to have fewer pieces in them, but as their manufacture is in quite large quantities, manufacturing method make up for what seems to be unnecessary complication.

An example of Italian construction is the Fiat single-seater scout. This is in steel, with the exception of the ribs, which are of light alloy. While there is much to admire in the construction, the spars are of a design which does not look good for a stress of much more than 25 tons per square inch, and which does not appear to be particularly easy to make.

Light alloy petrol tanks are increasing and are now made without welding or solder in most designs. I believe that some form of jointing material is used, but I could not find out how permanent it is likely to be.

I found no novelties in aerodynamic design. Most machines are biplanes and not a few of the monoplanes have so many struts that they would almost certainly have gained by having a lower plane. There is a marked absence of balance for control surfaces, even in the larger machines. Ailerons are frequently long and very narrow; rudders and tail planes are almost always inadequate according to English ideas, and this is probably the result of larger aerodromes and faster landings. Fuselages seem to be getting bigger in cross section than is strictly necessary, and in certain instances seriously affect the pilot's view. There are no helicopters, nor even an autogyro, neither is there any use of wing slots or slotted controls. Wing sections are on the whole rather thicker, though not very noticeably so.

These few notes are not meant to be a review of the Paris Show. They are rather a personal record of tendencies, and an attempt to explain differences in development on the Continent and at home. If it seemed to me that two years had not brought much progress it must be remembered that two years is a very short time, and that there are no doubt more detail improvements, which are not very obvious, than I have space to describe.

AIRCRAFT AT THE PARIS SHOW.

(See double centre-page table.)

In this week's issue of THE AIRCRAFT ENGINEER we publish a table giving such characteristics as were available of the machines exhibited at the Paris Aero Show which closed its doors recently. In the main the table is self-explanatory, at any rate as regards that part of it dealing with dimensions and weights of the machines. The performance figures, too, are the usual. In order, however, to facilitate comparison of the merits of the various machines we have included in the table certain descriptive figures which are not usually given in English aircraft specifications. These are the "Everling Quantities," for a detailed explanation of which we would refer our readers to the last issue of THE AIRCRAFT ENGINEER (November 25, 1926, pp. 95 to 99). The three special columns are those giving "wing-power," "high-speed figure," and "altitude figure." In addition, we have included a column giving the "span loading," or $\frac{\text{span}^2}{W}$. This latter is not an "Everling Quantity," but is a figure very useful in performance calculations for the estimate of induced drag. (*See* "Aircraft Performance," by J. D. North, THE AIRCRAFT ENGINEER, April 29, 1926, pp. 40 to 43.)

Although we regard the table as being very useful for purposes of comparison, we would point out that too much importance should not be attached to the "Everling Quantities," not because these are not in themselves reliable, but for the simple reason that, in the case of the present table, the manner of deriving them is not altogether above reproach. For the quantities to be strictly reliable it would be necessary

to know the exact power developed by the engines at the performance to which the quantities refer, and also the propeller efficiency, although the latter could probably be estimated with a fair degree of accuracy. What we have perforce had to do in compiling the table is to use the nominal horse-power of the engines, and in certain cases this may, and in all probability does, differ very materially from the actual power. Consequently the "Everling Quantities" thus derived are not comparable with others based upon the actual horse-power. It is thought, however, that in the case of the Paris show machines, where mostly engines of the same make and type are used, the table may afford a reasonably good comparison, since even if the power of any one type of engine differs considerably from the actual power, the same figure is used for several machines fitted with that engine. Thus a comparison between machines fitted with a given type of engine should be fairly accurately comparable.

Referring to the table of data, it is found that the highest value of "wing power" is attained in the Nieuport-Delage 48 C.1, which has a power of 20·6 h.p./sq. m., or 1·91 h.p./sq. ft. of wing surface. In other words, it is a powerful machine with small wing area. Second comes the Bernard sesquiplane with a "wing power" of 20·4 h.p. sq. m. (1·90 h.p./sq. ft.). Actually it seems possible that other machines may have as high figures because of their engines being of much greater power than the rated or nominal power.

The highest value of "span square divided by weight" is reached by the little Caudron parasol monoplane with 40 h.p. Salmson engine, the figure for which reaches the high value of 1·16. As the average value of this figure is around 0·5 or 0·6, it will be seen that the induced drag of the Caudron parasol should be very low. On the other hand, such high values are only practicable in relatively slow machines.

Turning to the column of "high-speed figures," it is found that here the highest value (34·5) is attained by the Bleriot-Spad 61. A word of warning might not, however, be out of place here, as this machine provides a very good example of the somewhat doubtful procedure of taking as a basis the nominal power of the engines. In the case of the Spad 61, the rated power of the Lorraine engine is 450 h.p., but it must be realised that the engine in this particular machine was fitted with a supercharger, so that the power would be much greater or rather the power would be developed at altitudes. Actually, we understand that the top speed claimed (283 km./h.) is attained at 5,000 m. This would have its effect upon the "high-speed figure."

Other excellent "high-speed figures" are attained by the Farman night bomber (23·0), the S.E.C.M. commercial monoplane and the Nieuport-Delage 42 C.1 (22·0).

As regards the "altitude figure," two of the best machines in this respect, *i.e.*, the Spad 61 (world's altitude record holder) and the Potez G.R. 28, have figures falling right outside the graph of Professor Everling published in our November 25 issue. Of the two the Potez is farther outside the limits of the graph than is the Spad, which rather seems to indicate that the Potez is the more efficient (in this respect) of the two. On account of the use of nominal power, however, it is almost impossible to decide definitely. There can be no doubt that both are very good as regards ceiling. In the case of the Potez it is, of course, not so much the actual altitude as the ceiling with a very heavy load which gives the machine such an excellent "altitude figure."

From the table one machine appears to stand out as a particularly efficient aeroplane. This is the Czechoslovak Aero Ab. 11 with 240 h.p. "Perun" engine. In spite of its low power, this machine has a good top speed and a high ceiling. The result is reflected in the columns giving "high-speed figures" and "altitude figures." The former is as high as 27 and the latter 9·4. Both are excellent, and here is a machine about which there is very little doubt. The engine normally develops the rated 240 h.p. at 1,400 r.p.m. It is, however, of the high-compression type and is claimed to maintain its power up to an altitude of 10,000 ft. This fact doubtless has an important bearing upon the ceiling of the machine.

Finally, it should be pointed out that in the column headed $\frac{\text{span}^2}{W}$ the figures given are for British units, *i.e.*, span in feet and weight in pounds. The "Everling Quantities," on the other hand, are in metric units, this being necessary because the original Everling figures were in metric units, as were also the nomographs employed for reading off the figures. In any case it is considered advisable to retain the metric units for the "Everling Quantities" so as to facilitate comparison, for which purpose a uniform system of units is necessary.

TECHNICAL LITERATURE.

AERONAUTICAL RESEARCH COMMITTEE REPORTS.

EXPERIMENTS RELATING TO THE ELECTRIFICATION OF BALLOON FABRICS.

By GUY BARR, B.A., D.Sc.

R. & M. No. 1017. (M. 37.) (10 pages.) June, 1926. Price 9*d*. net.

The experiments described in this paper arose from a discussion on lightning risks in airships. They were undertaken :—

(1) To find a method of making the surface of balloon fabrics conducting.

(2) To investigate the electrification produced by the ripping of rubbered fabrics.

Samples of various fabrics sprayed by the Schoop method with metallic aluminium and with zinc, have been examined, particularly with reference to the permanence of the conducting layer. Alternative methods of producing a conducting surface have been tried, and the conductivities of a number of materials representing current practice have been measured.

Two- and three-ply rubbered balloon fabrics have been separated into plies and also broken as a whole in an apparatus permitting examination of the resultant charge, and also in an atmosphere of hydrogen and air.

Spraying with metal gives a layer of low electrical resistance (3—7 ohms per cm.^{2}) at the cost of an increase in weight of 4 oz/sq. yd. or more ; the resistance is liable to increase if the material is crumpled, but falls to a low value if a potential of 10-100 volts is applied. If the coating is impregnated with dope, this recovery eventually becomes impossible. Fabric doped on the upper surface after having been sprayed on the under surface was satisfactorily conducting after five months' exposure.

The most satisfactory treatment so far discovered, involving only small increases in weight, consists in the application of graphite in the form of an Aquadag suspension. A weight of some 3 grms./sq. metre gave a resistance of 0·03 to 2 megohms/cm.^{2}, which was not much increased by doping, and with a weight of 4 or 5 grms./m.^{2} a resistance of 3,000 ohms/cm.^{2} was obtained after doping.

When the plies of a rubber-proofed two-ply fabric are rapidly separated, the cotton surface left bare becomes positively changed, the rubber attached to the other ply being negatively changed. The extent of electrification varied in different experiments, the maximum observed being of the order of 4,000 e.s.u. per square metre of separation.

It is suggested that the graphitisation of the fabric be studied more closely ; exposure tests should be made on the coating already obtained, and experiments made to see if the conductivity can be further improved.

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THE NEW SHORT ALL-METAL AIRSCREW

CONSIDERABLE improvements continue to be made in the development of the all-metal airscrew for aircraft, and we have just received particulars of the latest efforts in this direction from the pioneer aircraft constructing firm of Short Bros., of Rochester and Bedford.

The " Short " metal airscrew, which has recently undergone flying tests with most gratifying results, has been developed by the firm to meet the demand for a metal airscrew, giving the increased efficiency that is characteristic of the thin sectioned type duralumin blade, with a system of construction that is both simple and cheap to produce, and durable in service.

The most important feature of the " Short " metal airscrew is the separate construction of the blades, which are interlocked together at the boss on the well-known halved-joint principle.

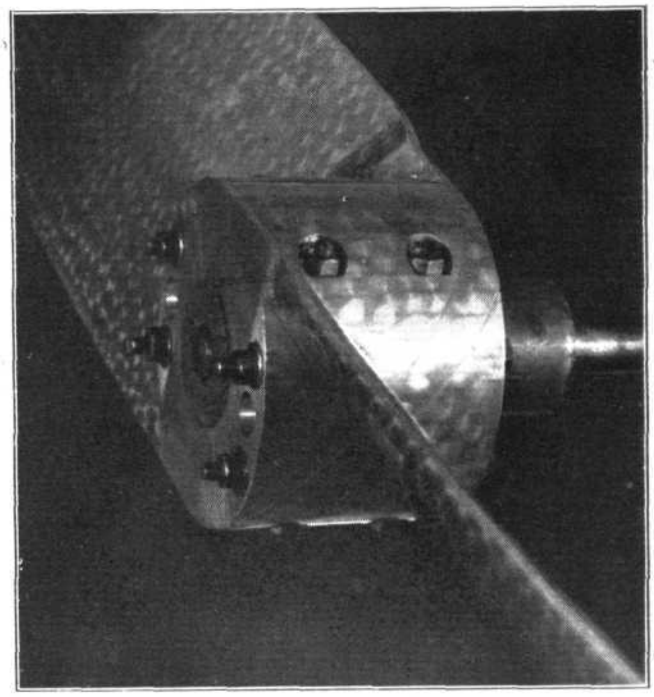
The advantages of this construction are several, as for instance, the detachability and easy replacement of a blade in the event of damage, the cutting of the blank with the minimum wastage of material, and the small size when dismantled and packed for transport, as will be appreciated by a reference to one of the accompanying illustrations.

Moreover, with this system of construction the four-bladed type of airscrew is a practical proposition, the blades being joined at the boss in a similar manner to the two-bladed type. The advantages of detachable blades for transport are all the more apparent when four-bladed screws are employed. This type is in fact, now being developed and a design is being prepared.

The blades of the " Short " metal airscrew are formed in a similar manner to that adopted in the construction of duralumin airscrews, now being extensively used in this country and abroad, that is to say, the cutting of the blade from a duralumin slab to a plan-form tapering towards the tip, milling all over to the correct section, and finally twisting the blade to the desired pitch angles. It is obvious that the operation is simplified in the " Short " system of joining the blades at the boss at a considerable angle to each other. Moreover, in avoiding a sudden change in the angle at the root of the blade that is necessary in the single unit type, the stresses at the point are considerably relieved, resulting in a more uniform load with consequently less likelihood of change in pitch of the blade under air load.

The method of joining the blades and the boss construction is clearly shown in the accompanying photograph.

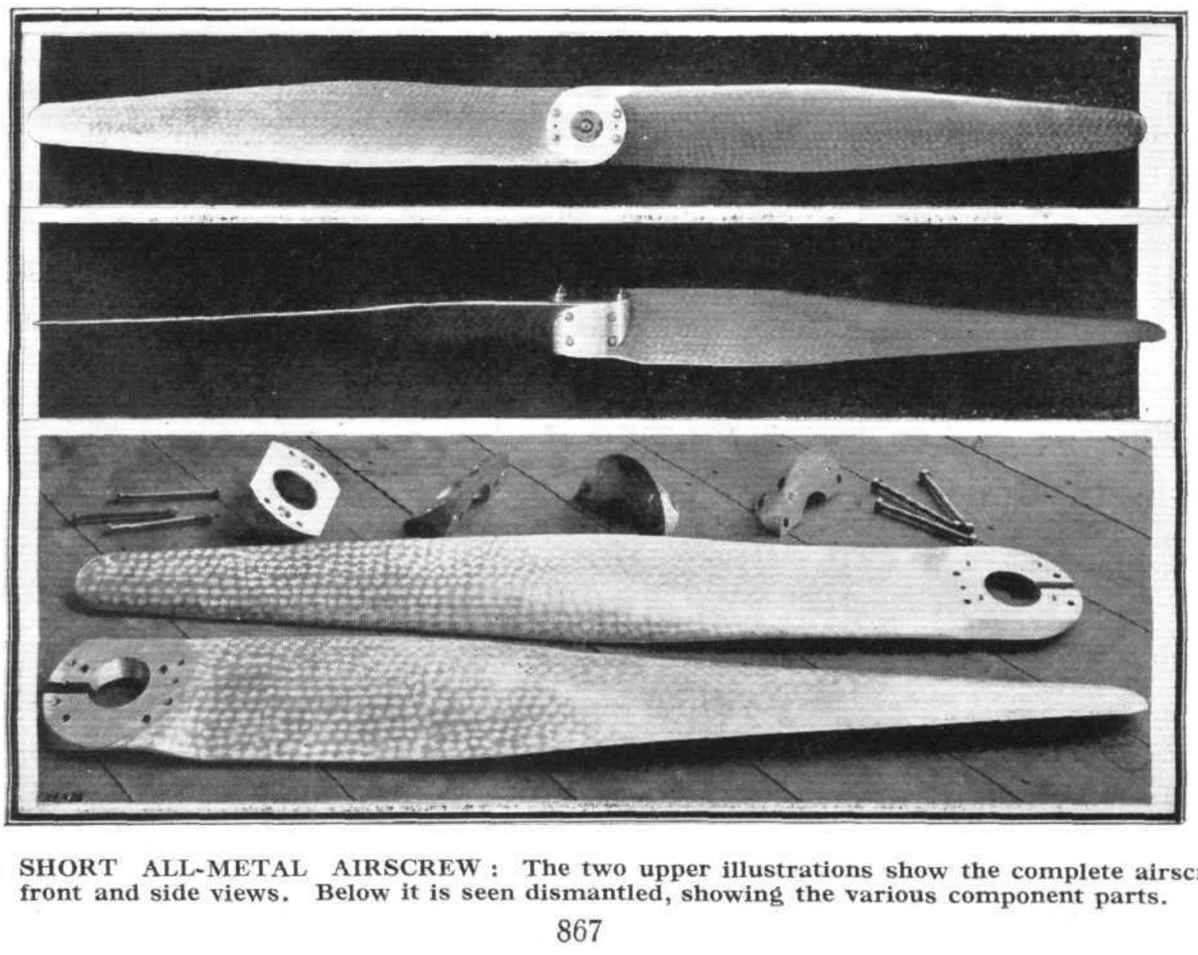
As will be seen, each blade at its inner end has a central longitudinal notch enabling it to engage, at approximately a



THE SHORT ALL-METAL AIRSCREW : A detailed view of the assembled hub.

right angle with its oppositely extending companion blade, the two blades being then interlocked on the halved-joint principal.

The angular spaces between the blades at the point of the junction are filled by solid blocks of Duralumin or other suitable material of corresponding angularity so shaped



THE SHORT ALL-METAL AIRSCREW : The two upper illustrations show the complete airscrew, front and side views. Below it is seen dismantled, showing the various component parts.

externally as to constitute—when assembled with the blades—the hub or boss of the airscrew, the whole assembly being then drilled as a unit and rigidly locked together by bolts, as is clearly illustrated in the detail photograph of the boss.

The flying tests carried out with this airscrew, fitted to the Short "Mussel" seaplane with "Cirrus" engine, have been more than satisfactory in every way, not only is there an improvement in top speed to the extent of 3 m.p.h. compared with the results obtained with the best of several wooden propellers, but the same falling-off in efficiency at slow forward speeds that is characteristic of other airscrews of this type, has not appeared.

It appears that the increase in efficiency has been maintained over the whole of the range of forward speeds, in fact, the machine will, when fitted with the metal airscrew get off in a dead calm with 70 lb. more load than with any wooden airscrew yet fitted. The climb shows a similar improvement, and, on test, pilot reports no undue vibration. Furthermore, no ill effects from water thrown up with the floats have appeared.

RUGBY FOOTBALL

NAPIER'S Rugby Football Club beat the Rugby team of B.T.-H. by two goals and one try (13 points) to love at the Napier ground at Acton on Saturday, December 18.

The ground was in good condition, but there was a cold wind blowing, which seemed to chill the outsides when the ball did not come their way. Probably it also interfered with the passing of the outsides, which was never very brilliant, though the B.T.-H. three-quarters were the more accurate in handling. They were not, however, able to break through the resolute defence of the Napier team, though Wallace always looked dangerous when he had the ball, and, being tall and a strong runner, was not easy to tackle. He put in a number of very good runs, but his movements never ended in a score. For the Napier team Burns at fly-half was in a class by himself, both in defence and attack, in addition to which he kicked two goals from tries, the second one a beauty from a difficult angle and in badly failing light. One fault common to nearly all the backs on both sides was an inability to find touch when they punted. Often they did not even try to do so, but merely kicked ahead and hoped for the best.

The game consequently developed into a series of loose rushes by the two packs of forwards in turn, and both packs showed considerable skill in keeping the ball at their toes, making good pace, and eluding the heroic defenders, who resolutely threw themselves in the path. For one period in the second half there was no regular scrum formed for about 15 minutes, while the forwards rushed the ball to and fro.

At the kick-off B.T.-H. got down into the Napier ground, but were speedily driven back. The Napier three-quarters were given a good opening by their halves, but a dropped pass stopped the movement. The Napier forwards pressed hard, and, as a result, Mark, the scrum half, dived over for a try, which was not converted. B.T.-H. then had a spell of attacking, but spoiled their first chance by kicking over the line. They came back again, however, and there was a series of hard-fought scrums on the Napier line. Napiers then did a very daring thing. Getting the ball in the scrum they actually heeled, and Mark coolly passed back over his own line to Burns, who touched down. It seemed about this time that B.T.-H. must score, but finally they drove themselves back by kicking over the line once and again.

Napiers had their turn of attacking, but Wallace relieved with a real good jinking run. Napiers got the ball out to their right wing, and Hutchinson cut through in excellent style and scored a try which Burns converted.

Towards the end of the game Napiers asserted clear superiority, Warner put in a very good run, and a little later Harvey dribbled down to the B.T.-H. line and Warner took the ball over, but was whistled back for a knock on at an early stage of the movement. The Napier full back soon after damaged a knee, a joint which has given him trouble before, and had to be carried off the field. Burns took his place, and this should have weakened the Napier attack. Their forwards, however, took matters into their own hands, and after a series of hot rushes Robson-Elgee scrambled over in the corner. Burns's kick, which added the full points, was, as already stated, a beauty.

TEAMS.—*Napiers*: P. Foulds (captain), full back.

H. W. Whymper, A. K. Harvey, A. P. Wright, and R. H. Hutchinson, three-quarters.

R. H. W. Mark and D. S. Burns, half-backs.

G. Pate, C. Robson-Elgee, G. E. Young, H. J. S. Rowe, S. Pearson, A. E. Benson, J. Furness, and A. G. Warner, forwards.

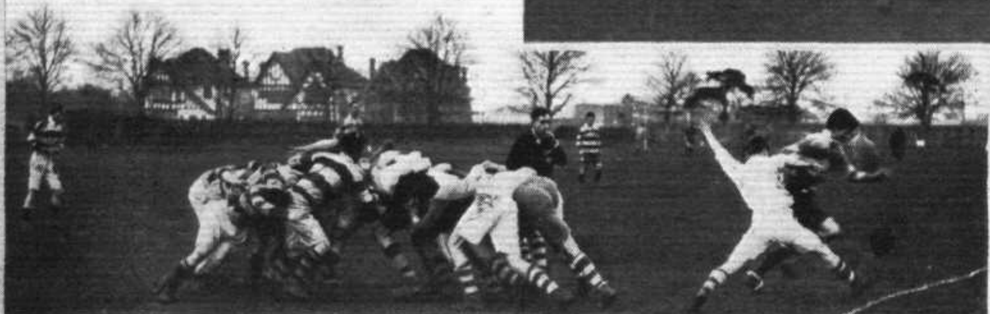
B.T.-H.: A. H. Cash (captain), full back.

E. A. Lennox, C. C. Wallace, G. W. Rowlatt, and E. G. Mackie, three-quarters.

W. H. Mann and Eiloart, half-backs.

C. J. Higgins, J. W. Seaton, C. F. Humphreys, B. F. Dobson, A. Mackay, E. R. Smith, E. Mowbray, and G. Hastings, forwards.

F. A. DE V. R.

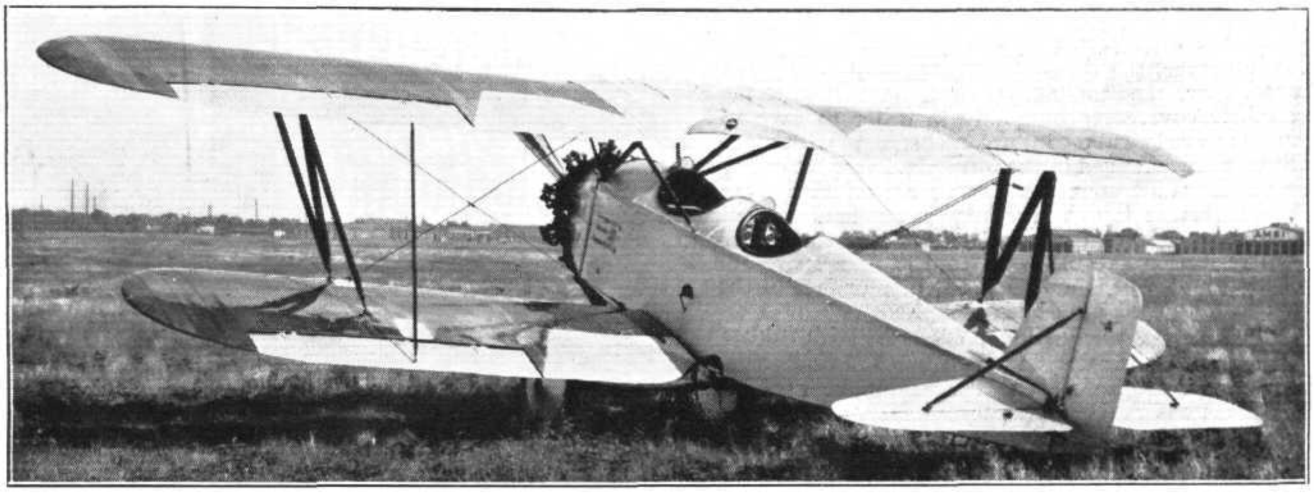


NAPIER v. B.T.-H. RUGGER MATCH: Top, a Line-out near Napier's goal. Bottom, a Scrum in B.T.-H. Territory.

THE ALBATROS L.68A SCHOOL MACHINE

100 H.P. Siemens Radial Air-Cooled Engine

The Albatros L.68A illustrated in the accompanying photographs has been designed and constructed by the Albatros Aircraft Works, Ltd., of Johannisthal, Berlin, as a result of their experience with an earlier type of similar lines, the L.68. The new machine, whose series number is L.68A, is intended for school work and for sporting and demonstration flying. In order to fit it for the latter, it has been designed with rather higher factors of safety than usual.



THE ALBATROS L.68a : Three-quarter rear view. The wings are mainly planked with three-ply, although trailing edge and flaps are fabric covered. The ailerons incorporate the Handley Page -Lachmann slot.

The L.68a is, it will be seen, characterized by a fairly heavy stagger of its biplane cellule, and as regards its lines looks singularly "un-German," resembling much more a British machine in its general layout. It is a rather curious fact that of recent years there appears to have been in Germany a reversal to the biplane type, which once upon a time was far less popular than the monoplane, but which again seems to be coming into its own for smaller machines. Large German aircraft is still almost entirely of the monoplane type. There can probably be no gainsaying the fact that weight for weight the biplane structure is superior to the monoplane from a strength point of view, and even aerodynamically it is very doubtful whether the monoplane, and particularly the cantilever monoplane, is really as efficient as its apparently "clean" lines might lead one to suppose.

In the Albatros L.68A Herr Schubert, the Albatros chief designer, has been content to follow orthodox lines, and the machine presents no unusual features aerodynamically if we except the fitting of slot-ailerons. In connection with these it should be noted that the ailerons do not extend right out to the rounded wing tips, but stop short approximately where the wing tip curve merges into the straight trailing edge. At the inner end also, the ailerons do not run right up to the fuselage (in the case of the bottom wing), nor to the top centre-section, but are altogether of relatively short length, and, it would seem, to some extent inefficiently placed in that their already short span may be rendered less effective by so placing them that they work on a relatively short lever arm. However, so far as we know the machine has very good lateral control, so that presumably the extra effectiveness of the slots makes up for the short distance of the lateral centre of pressure from the centre line of the machine.

THE ALBATROS L.68a : Side View. The engine is a 100 h.p. Siemens radial.

The Albatros L.68A is of "mixed" construction in that the wings are of all-wood construction, while the fuselage is a steel-tube structure covered with fabric. In section the fuselage is of the flat-sided variety, but with a slightly cambered deck. The tail members are also of metal construction, the structure members being arranged to give triangulation. The tail plane is of the trimming type, its rear spar being braced by struts to the fin, and the front spar being elevated or depressed for trimming. The tail skid, it might be pointed out, is so mounted as to steer with the rudder in order to make the machine easy to taxy in a wind.

The wing structure, as already mentioned, is of all-wood construction, the planking being in the form of three-ply, which extends from the leading edge up to the false spars carrying the ailerons. Near the fuselage and top centre-section, however, the three-ply planking only extends to the main rear spar, the remaining portion aft to the trailing edge being fabric covered, presumably in order to save weight. Streamline steel tube interplane struts with incidence adjustment are arranged in the form of a letter N, and top and bottom ailerons are connected by a strut on each side. The top centre-section is of fairly large span, and is swelled to accommodate the gravity petrol tank. The trailing edge of the centre-section is cut away to the rear spar, and the petrol level indicator is mounted on the rear face of the spar where it can be read from both cockpits.

The undercarriage is of simple Vee type, with rubber rings in compression forming the shock absorbers in the telescopic front legs. There is an oleo dashpot arrangement for checking bouncing.

The 100 h.p. Siemens radial air-cooled engine is mounted on a swivelling engine plate, which gives easy access to the back of the engine. The petrol feed is, as already stated, by direct gravity flow from the tank in the top centre-section. This tank has a capacity sufficient for four hours' flying.

As regards the two cockpits it may be mentioned that these are of generous proportions, and allow of the occupants employing, if they wish, parachutes of the pack type. The seats of both cockpits are adjustable.

Following are the main dimensions, weights and performances of the Albatros L.68A:—Length o.a., 6·3 m. (20 ft. 9 ins.); span top plane, 10·1 m. (33 ft. 2 ins.); span, bottom plane, 9·05 m. (29 ft. 9 ins.); wing area, 24·4 m.^{2} (263 sq. ft.). Weight of machine empty, 655 kg. (1,440 lbs.); useful load: pilot and passenger, 1760 kg. (352 lbs.); petrol, 100 kg. (220 lbs.); oil 15 kg. (33 lbs.); disposable load, 25 kg. (55 lbs.); total useful load 300 kg. (660 lbs.); total loaded weight, 955 kg. (2,100 lbs.). Wing loading, 39·8 kg./m^2. (8 lbs./sq. ft.); power loading, 9·5 kg./h.p. (21 lbs./h.p.). Wing-power, 4·1 h.p./sq.m. (0·38 h.p./sq.ft.) Top speed, 140 km./h. (87 m.p.h.). Climb to 1,000 m. (3,300 ft. in 12 minutes.

"Loading-figure" (metric), 59·9; (British), 59·4).

The "loading-figure" is the power loading multiplied by the square root of the wing loading.

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"AIRSHIPS"

THE monthly house dinner at the Royal Aero Club was held on December 15, with the Right Hon. Lord Thomson of Cardington in the chair. The subject for discussion was "Airships," but the speeches dealt mostly with the Airship Club, which is a subject which does not call for much in the way of debating powers.

After the loyal toast had been honoured, the Chairman rose and said that future generations would look upon R.33 much as the present age regarded H.M.S. *Victory*. As for R.101, he prophesied that before long it would be regarded as a pale phantom of the mighty airships which would follow it. We could not get away from the fact that we lived on an island, and we must devote our attention to long-distance flights. He then called upon Mr. Griffith Brewer, chairman of the Airship Club, to open the discussion.

MR. GRIFFITH BREWER said that he was the oldest member of the youngest club in the world, the Airship Club. His friend, Capt. Boothby, whom he congratulated on his promotion, had asked him to be chairman of that club for a Gilbertian reason. Sir Joseph Porter became the ruler of the Queen's Navee because he had never been sick at sea, and he (the speaker) had never been up in an airship. He spoke with gentle satire of the "activities" of the Airship Club. Financially they could not get on very fast, but they owned one balloon and hoped to obtain two more. The one which they possessed held 80,000 cub. ft. of hydrogen. It had competed in the Gordon Bennett race, and, though it had not won the cup, still the crew had given a fine exhibition of British resource and determination. As for airships, he had seen rigids in the distance. He had also seen small airships from afar. In the war, small airships had proved a necessity for convoying surface merchantmen, and one of them had spent 55 hours in the air on one flight while escorting the *Aquitania*. It had a crew of two men. He doubted if airships would be such good fun as free balloons. They had read great news in the papers that morning about the large airships.

COL. MOORE BRABAZON said that he did not know anything about airships. Once he had embarked on a civil airship and had walked the plank at a considerable height in a strong wind, which he thought was a terrifying experience; but he understood that for the new airships there would be a lift up the mast and a covered gangway. It was rather strange to see a new club formed for free ballooning, for the Royal Aero Club itself had been formed originally for that purpose. He believed that the history of flying would be much like the history of motoring. Each had started as a sport, and he recalled some of the early ways of motors. Aeroplanes also started as a sport. With aeroplanes the difficulty was night flying. And then there was the discomfort. They were a perfect hell—the discomfort was quite abominable. They must be made comfortable. He liked the lay-out for the saloon of R.101, with its foyer, palm trees, a bar (laughter)—he had not seen where the billiard table was, but he felt sure there was one. He concluded a breezy speech—"Here's to Airships!"

ADMIRAL MURRAY SUETER was glad to see two veterans of airships present, Mr. Oswald Short and Capt. Boothby. He spoke of the "Mayfly," which did not fly. But it was a great success. It was moored at a mast for four or five days in a gale. When they broke her in moving her into the shed, an Admiral who knew nothing of airships was sent down to hold an inquiry. He looked at the airship and said: "The work of lunatics!" Well, thanks to the work of lunatics, the Germans patrolled the North Sea with Zeppelins during the war, and it was thanks to one of them that H.M.S. *Cressy* and her two consorts were torpedoed. At Jutland we should have gained a great victory had not the airships all been on the side of the Germans. We were always too late. Afterwards the R.34 flew the Atlantic twice. Little airships made good escorts. He congratulated Lord Thomson on the decision he took when he was Air Minister to go on with airships. Had that been taken before, we should have done more in the war.

MAJOR G. H. SCOTT remarked that a rigid had been described as "a bunch of balloons in a birdcage." All big developments had been started by so-called lunatics. He approved of the Airship Club taking to free ballooning, as the balloon was the egg from which the airship was born. The Royal Aero Club had started as a balloon club, but something went wrong and it took to turning out aeroplane pilots. Now the Airship Club in due course would turn out airship pilots.

CAPT. BOOTHBY put in a plea for the airship of small or medium size. He believed that the big airship was now past its troubles. If they used helium, as they could do from the Canadian supplies, it would be the most formidable of all aircraft in war. He believed that airships of medium size, round about 30 tons (R.101 is to be 155 tons.—*Ed.*), could do useful work on routes of moderate distance round the shores of India, Australia and other Dominions. He thought the medium airship ought to share feeder line work with aeroplanes, but that was not the policy of the Air Ministry. He believed that aeroplanes were not reliable even with three engines. A little bird had told him that if one engine stopped, the other two took on a nice cheerful colour, and the pilot landed. He held that the Air Ministry should pay a subsidy for *aircraft*, and leave it to the operating firm to select the type.

WING-COMMANDER T. R. CAVE-BROWNE-CAVE said that the large airship was by far the most important development at the present time. Nevertheless, he was a great believer in the small type. To travellers he would say, "Go by airship and be comfortable!"

FLIGHT-LIEUTENANT BOOTH was glad that the Airship Club was going in for free ballons. It was a most pleasant form of travel, free from noise, smell, and air sickness.

FLIGHT-LIEUTENANT ELMHIRST said that he was not a

member of the Airship Club, but he meant to become one. Ballooning was a most delightful sport, and from it people would get on to airships.

COL. V. C. RICHMOND recalled that once it had been said that sea ships of iron were contrary to nature. In the same way some people thought it mad to try to send 80 tons of metal up into the air. Speaking as an engineer, he was convinced that they could make the airship a sufficiently strong and useful vehicle. He felt it in his bones. The mooring mast was the key to the operation of airships. The strains at the mast were the governing principle up to three-quarters of the length of the ship. It was a new problem. They had had to experiment with ships not designed for mooring. They were using steel to save weight; that was not generally recognised. In a big job it was stronger, weight for weight, than duralumin. In a large ship they could make a joint which was not a thing like a mouse-trap suffering from appendicitis. He was a great believer in small airships. They would have a future when funds and facilities were available. At present there were none; and what would steamships do if they had to provide all their own ports? Later on, the small ships would be able to use the stations prepared for the large airships.

MAJOR C. C. TURNER disclosed the fact that the balloon possessed by the Airship Club had been the free gift of Mr. Griffith Brewer. He had done a lot of ballooning in 1907 with the late Air Commodore Maitland, and it was his ambition to introduce his friends to its joys. He told how in 1909 the German public subscribed £300,000 to help Count Zeppelin in his programme. Speaking as a newspaper man he almost despaired of the possibility of awakening a like enthusiasm over here; but it might come when the two big airships got going.

MAJ. F. A. DE V. ROBERTSON said that when airships were discussed one often heard a good deal of prejudice expressed against them. No such thing had been heard that evening. He was not an airship man, and had never been up in one. In the R.A.F. he had dealt with aeroplanes, and for the last ten years had been trying to persuade people that they were safe and comfortable. He could not be accused of prejudice against the aeroplane, and so he would say that if and when the two big airships proved a success they would give a fillip to the aeroplane movement such as it had never had before. The commerce of Calcutta and all India was based on a weekly mail about 17 days old. When airships brought letters in four days, perhaps twice a week, it would revolutionize Indian commerce. It would be impossible to take 36 hours, as now, in getting the mails across India by train. They would have to be carried through the night by aeroplanes. The same thing would happen in Australia, and there would be aeroplane feeder lines along the route.

MR. OSWALD SHORT paid a tribute to Admiral Murray Sueter. Once he had proposed to the Admiralty to build an airship of 2,000,000 cub. ft., and it had been turned down on account of the size. Admiral Sueter was not in charge then. He believed in small airships, and recommended aircraft designers to study airship possibilities.

MR. G. C. COLEBROOK said that the public remembered accidents but forgot good work. If the future of the big airship were a gamble (which he did not believe), it was one which the Empire must take. The future of the Empire lay in communications, and he instanced the changed attitude of General Hertzog towards the Empire after the Imperial Conference, as a proof of the value of frequent personal contact.

The chairman then said that he had been specially requested to call on two "anti-airship" speakers, and he called on Mr. C. G. Grey and Col. Robert Lorraine.

MR. C. G. GREY said that he was not anti-airship, though he should hate to go up in a machine filled with inflammable gas. There was no chance of using helium, and, after the coal strike, even coal gas was too dear. Airships might be useful as aeroplane carriers, but he was doubtful about their use for patrols. He had once had a friend in the Navy who commanded a submarine. He once pointed his gun at a Zeppelin, and the airship sheered off. Airships might do for high officials who liked to travel in comfort—if the airships were adequately protected by aeroplanes. As for free ballooning, it reminded him of the Chinaman's description of tobogganing, "Go like hell, and walk back three miles."

COL. LORRAINE also denied that he was anti-airship. On the contrary, he was quite for them. He had been up with Mr. Willows, and had enjoyed it very much, and he was quite in favour of the Airship Club.

Winding up the debate, Lord Thomson said that his impressions of it were various. He himself was a large airship man, thanks to the arguments of Col. Richmond. After he had left the Air Ministry he went to the United States and visited Lakehurst. He made friends with the late captain of the "Shenandoah," who had professed himself a "hydrogen man." He was in such a funk of wasting the precious helium that it quite cramped his style as an airship captain. As Maj. Robertson had shown, there was no competition between airship and aeroplane; it was the airship for over water, and the aeroplane for over land. He could believe that in a free balloon one could consider calmly the affairs of the world below, while reconciling oneself to the prospect of returning home by some other means of locomotion. He wished all success to the Airship Club.

COL. MOORE BRABAZON proposed a vote of thanks to the chairman in very warm terms, paying a tribute to the decision he took when in office, when it must have been difficult to do the big thing. Lord Thomson briefly returned thanks.

THE ROYAL AIR FORCE

London Gazette, December 21, 1926.

General Duties Branch

The following Pilot Officers on probation are confirmed in rank (Dec. 2):—E. G. Searson, H. J. Walker. The following are transferred to the Reserve:—

Class A.—Flight-Lieutenants: G. Birkett; Dec. 5. D. Craik, D.F.C. Dec. 19. F. J. Watts; Dec. 19. Flying Officer C. C. K. Dagg, A.F.C.; Dec. 23.

Class B.—Flying Officer R. J. Copley; Dec. 19.

Class C.—Flying Officer F. R. Eason; Dec. 23.

The following resign their short service commns.:—Flight-Lieut. A. A. Ward (Lieut., R.A.R.O., R.A.); Dec. 10. Flying Officer D. C. H. Ferguson; Dec. 11. F. H. Kennedy, Lieut. R.N., Flying Officer R.A.F., relinquishes his temp. commn. on return to naval duty; Oct. 31. Flying Officer A. Leslie-Moore relinquishes his short service commn. on account of ill-health and is permitted to retain his rank; Oct. 30. Pilot Officer G. F. G. Cox is dismissed the service by sentence of General Court-martial; Dec. 3.

Stores Branch

Flying Officer H. J. Hunter is granted a permanent commn. in this rank, with effect from Nov. 24, 1925, on completion of probationary service. Flying Officer on probation H. Seidenberg is confirmed in rank; Oct. 6. Pilot Officer J. E. Welman takes rank and precedence as if his appointment as a Pilot Officer bore date Aug. 10. Reduction takes effect from Nov. 25.

Memorandum

Lieut. L. W. B. Parsons relinquishes his temp. commn. on re-enlistment in the Territorial Army; May 17, 1920.

Reserve of Air Force Officers

General Duties Branch

H. N. Miller is granted a commn. in Class B as a Pilot Officer on probation; Dec. 21. H. P. Wilson is granted a commn. in the Special Reserve as Pilot Officer on probation; Dec. 21. The following Flying Officers relinquish their commns. on completion of service:—A. L. Jones; Oct. 24. H. E. Winch; Oct. 24. G. S. Fiske; Nov. 27. W. J. Burr, M.C., D.C.M., M.M.; Dec. 17. S. P. B. De M. Bucknall; Dec. 19.

Princess Mary's R.A.F. Nursing Service

Matron Miss Grace Nicholson, A.R.R.C., is placed on the retired list on account of ill-health; Dec. 22.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander W. S. Douglas, M.C., D.F.C., to R.A.F. Depot, Uxbridge, for course at Imperial Defence College, 1.1.27.

Squadron Leaders: A. H. Peck, D.S.O., M.C. to H.Q., Iraq, 7.12.26. L. L. MacLean to Aircraft Park, India, 7.12.26. D. F. Stevenson, D.S.O., M.C., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt., 25.11.26.

Flight Lieutenants: J. V. Read, M.B.E., to No. 4 Flying Training Sch., Egypt, 7.12.26. I. M. Rodney to Aircraft Depot, India, 7.12.26. H. A. Smith, M.C., to No. 55 Sqdn., Iraq, 7.12.26. E. F. Turner and W. E. Knowlden, to H.Q., 7.12.26. L. M. Elworthy, to No. 84 Sqdn., Iraq, 7.12.26. H. J. Collins to No. 30 Sqdn., Iraq, 7.12.26. L. C. Wynne-Tyson, to Station Commandant, Basrah, 7.12.26. G. F. Moody to No. 6 Armoured Car Coy., Iraq., 7.12.26. M. A. Simpson, to R.A.F. Depot, Uxbridge, 1.12.26. M. H. Coote, to No. 29 Sqdn., Duxford, 1.1.27. L. Darvall, to Central Flying School, Wittering, 31.12.26. W. E. G. Bryant, M.B.E., to School of Army Co-operation, Old Sarum, 20.12.26. F. G. Brockman, to H.Q., Fighting Area, Uxbridge, 7.12.26. V. Buxton, O.B.E., to No. 14 Sqdn., Palestine, 18.12.26.

NAVAL APPOINTMENTS

The following appointments were made by the Admiralty on December 23:

Lieuts.—E. C. G. Ermen, C. A. N. Hooper, R. F. Jessel, D. M. L. Neame, A. O. Watson, H. D. Smallwood, H. S. Cooper, T. S. Jackson, and C. Campbell, attached to R.A.F. for period "A" (Jan. 4), to join No. 1 Flying Training School, Neverhaven, p.m. (Jan. 3).

Lieuts. (Flying Officers, R.A.F.).—J. H. I. Wood, to *Furious*, and for full flying duties in 443 Flight; N. R. Courthorpe Munroe, to *Victory*, and for full flying duties in 442 Flight; and E. J. E. Burt, to *Furious*, and for final deck landing training in 421 Flight (Dec. 21).

R.A.F. ELECTRICAL AND WIRELESS SCHOOL, FLOWERDOWN

Passing-Out Inspection of Apprentices

THE fifth Passing-Out Inspection of Aircraft Apprentices, who have been trained at the R.A.F. Electrical and Wireless School at Flowerdown, took place on December 17, when Air Vice-Marshal Sir John Steel, K.B.E., C.B., C.M.G., A.O.C., Wessex Bombing Area, inspected the apprentices and presented the awards, etc.

Group-Capt. R. P. Ross, D.S.O., A.F.C., Commandant of the School at Flowerdown, says in his report that altogether there are 248 Aircraft Apprentices under training, exclusive of the Passing-Out Entry of 36. Of the 248, 196 are being trained as wireless operator mechanics, 10 as instrument makers, and 42 as electricians. The standard of discipline and drill maintained by the present Passing-Out Entry has been excellent, and the educational standard attained has been very good indeed, especially in the technical sections and workshops; the whole of the syllabus has been covered.

The voluntary evening classes have been very well attended, and every aircraft apprentice has successfully operated wireless instruments in the air. The athletic qualifications of this entry have equalled, and in some cases have surpassed, the fine example set by the previous term. Keenness has been shown in the gymnasium and miniature rifle range, and there is promise of several gymnasts and marksmen of merit. The health of the aircraft apprentices has been very good on the whole.

Of the present entry, 10 have passed out as Leading Aircraftsmen; 20 as Aircraftsmen, First Class; and 6 as Aircraftsmen, Second Class. There have been no failures.

A cadetship has been offered to No. 364737 A/A T. Shelley, who is also the winner of the Hyde-Thomson Memorial Prize, kindly awarded by R. D. Hyde-Thomson, Esq.

The following are retained for the Advanced Course, with a view to passing out as Corporals:—

No. 364944 A/A A. F. Monks.
No. 364749 A/A S. V. Vaizey.
No. 365006 A/A F. J. Spedding.
No. 364760 A/A E. H. Webb.

No. 365006 A/A F. J. Spedding wins the prize offered by the Air Ministry for the aircraft apprentice who obtains the highest aggregate marks in all sections.

No. 364944 A/A A. F. Monks wins the prize offered by the Air Ministry for the aircraft apprentice who obtains the highest marks in technical subjects.

No. 364539 A/A W. Bourne wins the prize offered by the Air Ministry for the aircraft apprentice who obtains the highest marks in educational subjects.

PERSONALS

Married

At St. Mary's, Headley, Surrey, the marriage took place on December 15 of Flight-Lieut. JAMES ALEXANDER GORDON HASLAM, M.C., D.F.C., R.A.F., younger son of the late Mr. and Mrs. John Bailey Haslam, of Rugby, with HELEN KINNEAR, eldest daughter of the late Mr. H. M. CUTHBERT, of Cape Town, South Africa, and of Lady Seymour-Lloyd, and step-daughter of Sir John Seymour-Lloyd, K.C., of Headley Grove, Headley. Squadron-Leader T. E. B. Howe, R.A.F., was best man.

ALEC RYDE, R.A.F., was married on November 5, to JOYCE, only daughter of Capt. BARWICK, R.I.M. (retired).

To be Married.

The engagement is announced between Flight-Lieut. T. O. CLOGSTOUN, R.A.F., younger son of H. C. Clogstoun, C.I.E., O.B.E., and the late Mrs. Clogstoun, and KATHARIN, youngest daughter of the late Mr. and Mrs. W. J. N. LIDDALL, of Edinburgh.

Death.

LIEUT. MAURICE ANTHONY MAUDE, H.M.S. *Vindictive*, whose death from a shooting accident occurred at Kowloon, China, was born on June 15, 1900, and passed into the Royal Naval College, Osborne. After training for the Fleet Air Arm, he was appointed to the *Vindictive*, and served in the Aircraft Carrier *Hermes* at Malta, going from there to Hong Kong. When the *Hermes* was recalled to Malta, Lieutenant Maude was appointed to the command of a "Detached Flight" consisting of six seaplanes, at Hong Kong, in which capacity he was serving at the time of his death.

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The Air Pilot Monthly Supplement, No. 26. *December,* 1926. Air Ministry, Kingsway, London, W.C. 2.

Le Document Aeronautique de la Republique Tchecoslovaque. Ministere Tchecoslovaque des Travaux Publics, Prague.

Motorists and Motor Mechanic's Diary, 1927. Sir Herbert Austin, Longbridge Works, Birmingham.

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Catalogues

Armstrong Siddeley Aero Motors. Armstrong Siddeley Motors, Ltd., 10, Old Bond Street, London, W., and Coventry.

"*Aviation*": *Zenith Carburettor.* Société du Carburateur Zénith. 49–51, Chemin Feuillat, Lyon, France.

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc).

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21,808. F. W. LANCHESTER. High-speed multi-cylinder motive power engines. (262,174.)
26,380. F. M. GREEN. Aircraft. (262,228.)

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4.449. N. H. CEDERQUIST. Variable-pitch propeller. (262,303.)
9,717. H. AND M. FARMAN. Speed-reducing gear. (251,261.)
14,769. A. AND S. A. HARPER. Aerial propellers. (262,338.)
16,994. H. D. HEIDE (J. GOULD). Screw propellers. (262,349.)

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